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ELECTRICAL WORLD

New Yardsticks Force Competition

● ALL BRANCHES of the electrical industry must get off their plateaus of complacency to reach new heights of prosperity. This must be done under new conditions of competition and with a new philosophy of business conduct. There is no possibility of a reversion to the conditions encountered in past years.

● MARKETS must now be sold through the creation of consumer desire to buy and by the pressure of organized sales efforts. The "roughing-in" electrical sales job has been done and unfortunately this was done too easily and too readily. The irreducible minimum of products and services sold themselves and the industry was not hardened by fierce competition for its share of consumer dollars.

● NOW there are new yardsticks to measure performance and to stimulate competition. Already many utilities have been forced to rate reductions and consequent aggressive sales efforts by competition that has been subsidized by the government. The codes have introduced new yardsticks for manufacturers, wholesalers and retailers that cause a change in competitive conditions. In addition the automotive, the gas and many other industries are alert and aggressive in their endeavor to obtain a larger share of national purchasing expenditures.

● ENORMOUS POSSIBILITIES for industry expansion exist, but this expansion will not occur unless it is gone after intelligently and aggressively. Peaks of prosperity can again be reached by the electrical industry if all branches take cognizance of the new conditions and pull together for the common good. The lesson of the day is that the electrical industry must earn its own new deal.

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ELECTRICAL WORLD

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What in the World!

Announcement is made that President Roosevelt will insist upon acceptance of the St. Lawrence project as part of his recovery program. Governor Lehman also insists upon the acceptance of his utility bills. These two efforts are essential to the actual development of the project. The interesting thing is that the old devil "The Power Trust" is alleged to be the chief opponent of these measures. Political expediency resurrects something that is dead.

●

We just can't imagine living in a house with 87 kw. of electrical equipment. What new comforts and conveniences there must be in the sample Westinghouse home in Mansfield! But why not use the idea? There is nothing that compares with this electric service in the home.

●

The tales about the army air-mail flyers show that this is an age of specialization. Results are obtained only after training and experience in a business. Perhaps some of the municipalities that are so anxious to enter the light and power business will find this out later.

●

Reports arrive that energy output is exceeding all-time values on many properties. This is encouraging. It means an expanding business and a growing industry. Aggressive sales efforts will speed up this effect.

●

Important scientists pointed out last week that research and engineering developments point the way to prosperity and more employment. The statement of Owen D. Young deserves the most careful attention of all electrical men. It states the philosophy of progress.

L. W. W. MORROW, Editor

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March 3, 1934

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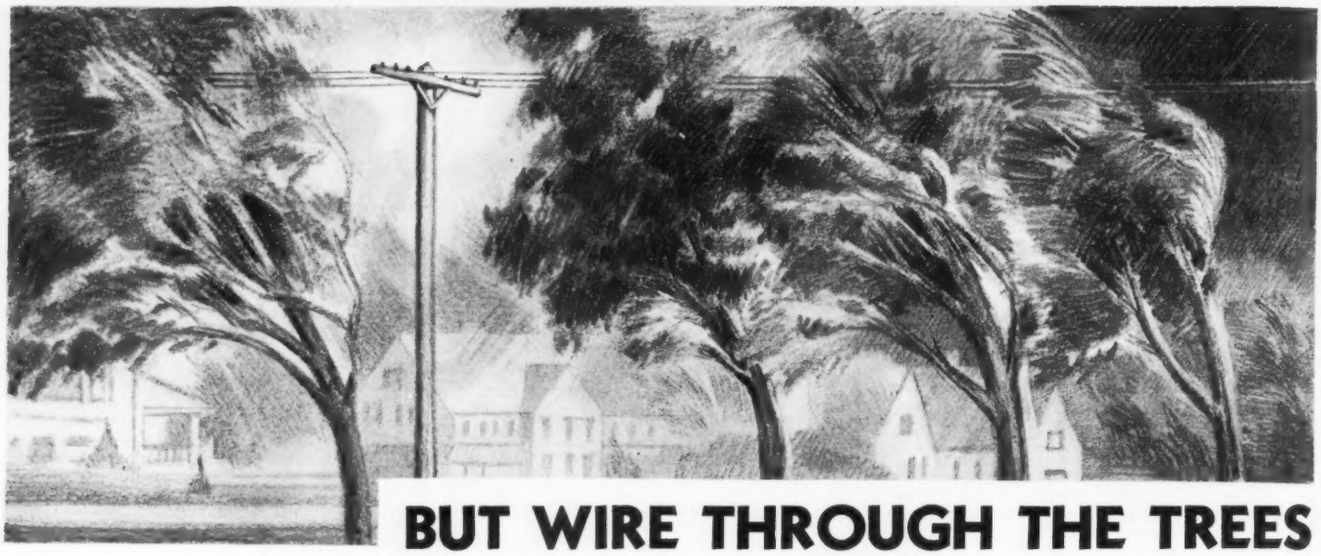

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ELECTRICAL WORLD

Established 1883—McGraw-Hill Publishing Company, Inc.

for the Week Ending

March 3, 1934

L. W. W. MORROW, *Editor*

Science Will Bring More and Better Jobs

LESS than half a dozen years ago the learned Bishop of Ripon addressed the British Association for the Advancement of Science with an earnest plea for a "science holiday." He asked a breathing spell so that, as he viewed it, an out-paced civilization might be permitted to catch up with its leaders in the realm of technical developments, of new discoveries and of the machine age. The world laughed and hurried on; to the depression. Today the cleric's fears have been partially transformed into restrictive action. Under certain trade and labor pleas the race of science toward its goal of a broader life for all appears to be in danger of being slowed.

One glance at the new industries which leaped during the past 50 years from apparent nothingness, but actually from scientific research and experimentation, to transform a nation in the doldrums to a nation prosperous beyond previous imagining should be enough to quiet the clamor of the opposition. Did the street railway wave make a boom in '93? Did movies, the automobile, radio, nation-wide electrification and mass production technique change the whole complexion of the business world for the better?

It was the contention last week of eminent American scientists, all members of the President's Science Advisory Board, speaking under the auspices of the American Institute of Physics and New York Electrical Society, that "science makes jobs." They were shooting at no straw man; no years-old protest of the cloth, no seven days' wonder of the all-but-forgotten Technocrats, but at the very real and sinister influence creeping into current labor and reform thought, seeking to damn science and invention and thus tend to dam the wonted flow of civilization. Science and engineering must demand recognition of their all-important contributions. It is interesting that President Roosevelt has discreetly supported the movement.

TODAY'S civilization is irrevocably committed to a mechanistic foundation. To stop is to slide back into darker ages. More science, more research, more commercial exploitation of dormant invention, more sound technical methods in all business, more machine refinement, more effort to bring the vague sociological world under the rigorous technique of the engineer and scientist are needed to correct what are palpably but maladjustments and out-of-step manifestations of the day.

More new products, more new industries, more jobs and better ones, more pay and more profit, more to sell, to spend, to buy, are the enduring goals. Is anything like a moratorium on science conceivably to be associated with such objectives? Science has always made more jobs than it eliminated—and all were better jobs. Science, given the chance, will do it again.

Code activities need study and understanding

Code work in the electrical industry is now going through the same process of bewilderment, discouragement and strife that in our national history marked the administrations of Washington, Adams and Jefferson. One was an experiment in political, the other in industrial self-government. In both, accomplishment could only come when men at last learned to work together on difficult tasks that they had never tried before.

The first reaction of those who have patriotically undertaken to develop and administer a code is amazement and dismay at the complexity of the problems that are involved. Next they are appalled at the amount of work that must be done. N.E.M.A. is submerged in the intricate relationships between its many divisions and sections, in addition to the natural conflicts between the viewpoints of large and small competitors. The wholesalers must not only bring order among themselves but orient their plans to the general wholesale code. The contractors take on a new status toward general construction. The power companies find themselves compelled to act as a national industry, whereas they have always thought as independent, non-competitive units.

PROBABLY the most important and delicate problem in the whole situation is to evolve a common understanding within each branch of the industry, so that some unity of thought and action can be achieved, with which to conquer the initial chaos. It is not easy. But it is vital. For unless men gradually come to recognize the essential principles that underly this organized co-operation, they will not want and do the same things. Therefore the general industry meeting held this week by N.E.M.A. is a welcome sign. It indicates an appreciation of this aspect of code administration. All manufacturers were invited to consider proposed changes in the code—whether members of N.E.M.A. or not—in the belief that it would help to crystallize industry opinion and it was done in the open.

These codes have been established in the public interest. There should be no secrecy in their operation. For in the electrical industry it is not enough that all the manufacturers should understand the N.E.M.A. code, hard as that is. The wholesaler, contractor and power man should also grasp the concept and the spirit of it. For without industry understanding these four codes cannot be co-ordinated and all groups will suffer. General Johnson's goldfish-bowl analogy applies right down the line. Code activities should be given the widest possible publicity.

Electric service reforms automotive service

Rapid advances in electrical applications are adding vastly to productive facilities in motor vehicle repair shops. Recent equipment is transforming some of these establishments from dingy and dirty places of drudgery to premises comparing favorably with the modern engineering laboratory. Some of this apparatus has been developed within the automobile industry itself to speed up tests of cars and trucks brought in for overhauling, like a portable switchboard for checking up ignition systems, car wiring, lighting units, and so on. Service stations have been willing to spend a thousand dollars apiece for such equipment units because under present conditions swift diagnosis of trouble and quick remedies are demanded.

Electric ovens are finding favor in connection with the baking of motor and generator armatures, and much ingenuity is being exercised in the development of special small motor drives for such work as stripping insulation and even enamel from wire in order to perform in a moment what used to take many times as long by hand. By mounting a couple of standard 600-watt electric heater coils in the top of an asbestos-lined box cover which could be slipped over four automobile batteries at a time one service station saved many minutes per assembly in heating battery compound to permit the rapid withdrawal of plates. Both still and moving advertising displays are being pressed into wider use in large establishments, and these generally call for long-hour consumption of energy. Electric boilers of small size are furnishing steam for tire vulcanizing, and the use of special systems of electric signaling, door-control motor installations and of concentrated lighting feature modernized service in progressive shops.

As one service station manager put it, acute competition and corresponding prices necessitate doing automobile repair work on the basis of quick and accurate production in order to realize satisfactory profit margins. Electrical auxiliaries therefore stand in the front rank of modern aids.

Fair play asked in public ownership

Interesting, significant public hearings were held in Albany this week and last on utility measures proposed by Governor Lehman of New York. The public, utility investors, private utility executives, bankers, professors and many others interested in the proposed legislation presented favorable and unfavorable arguments. The chief target for comment was the proposed municipal ownership bill, which is considered essential to the St. Lawrence project by its proponents. This bill permits municipalities to build competing utility systems if they so desire without getting the permission of the state commission and without any requirement that they purchase existing private utilities at a fair value. In all routine operations, municipal plants would be under the commission.

Floyd L. Carlisle presented a most able argument on behalf of the private utilities. He stated that competition by municipal systems free from taxation would result in the eventual ruin of the private utilities without any social gains. He offered to reduce utility rates at once the equivalent of taxes paid if the government would eliminate the taxation. He said that if it was desired to build a state utility system similar to that of the Hydro-Electric Power Commission of Ontario this could be done by the private utilities. Taking into account the favorable conditions in New York State, Mr. Carlisle said: "Take away taxation, put us on a comparable basis and we will make lower domestic rates than the Hydro of Ontario and make more money than we are making now." If the state desired to build such a system, then it was only fair that legislation should provide for the purchase of private utilities at a fair price and not for the ruinous competition that would come about by building new municipal systems.

BUT the greatest argument against the measures from the point of view of public interest is the absence of any state-wide concept of electric service. The bills permit each city to play a selfish game by using its favorable congested-area, heavy-load-density conditions and do not force the development of a widespread system to give electric service to industry, home and farm. The rural, village, small city and lightly loaded areas would be left to shoulder almost prohibitive costs if they wished to have electric service. Those experienced in the utility business know that the most economical service and the greatest social benefits are brought about by a regional or state-wide integration of all generating and distributing facilities.

These hearings but bring out once again the position taken by intelligent private utility executives and investors with respect to public ownership of utilities. They do not believe this is in the public interest, but agree that the decision rests with the public. If the decision is favorable to public ownership they ask that the private utilities be treated fairly. A fair price should be paid for their properties and they believe that public ownership operation should be placed upon a comparable basis with private ownership so that whether there is direct competition or not the same yardsticks will be used to measure the results. Moreover, as citizens, experienced utility executives believe the principles they have applied so successfully to build integrated utility systems in this country should be continued in the public ownership programs. This stand and this point of view are to be commended and should be better understood by the general public.

Challenge accepted

Up in Hartford Samuel Ferguson frequently does the unexpected but logical thing. Most recent of his innovations is an annual report to all his customers as well as the customary report to stockholders. One statement in this report is indicative of the rest. It is as follows:

"Our ultimate goal is the complete electrification of every home with the use therein of from 300 to 600 kilowatt-hours per month for light, cooking, heating, refrigeration, hot water and other uses. Recently the T.V.A., backed by the resources of the federal government, has avowed its intention of achieving a similar goal and it has been inferred that privately owned companies would suffer by comparison. *Your company welcomes* this challenge to match Yankee dollars and ingenuity against taxpayer dollars and the efficiency of governmental bodies."

Congratulations, Mr. Ferguson. This is the spirit that is needed. It is the policy adopted by the private utilities in the South that are neighbors to T.V.A. The utility industry has the will, the experience and the intelligence to meet this "yardstick" competition successfully.

Only All-Welded Construction Meets Mercury-

By R. H. ROGERS† and H. M. PRIEST‡

But for a figurative hand full of standard purchased parts which may require separation from time to time General Electric found arc-welded joints and connections to be essential for its mercury-vapor generating station.

Radical departures from ordinary fabricating problems, such as 3,080 tubes to be welded in seven drums of 30-in. pipe, were successfully instituted.

Electric welding achieves another victory.*

STRUCTURES, boilers and piping equipment are all arc welded in the new mercury-steam station at the Schenectady Works of the General Electric Company. Rivets are few and bolts are used only where things are to be taken apart; in fact, everything is welded but a few standard purchased parts.

All the building structure was fabricated and erected by the American Bridge Company, station piping was made and installed by the Pittsburg Piping & Equipment Company, and the mercury boiler equipment, including the mercury liquid heaters, and the mercury furnace walls were shop fabricated in the Schenectady Works. All welding of power equipment under Class I code welding was done by 30 General Electric regular welders qualified through the Hartford Steam Boiler Inspection & Insurance Company. Six of these did the erection work for the Pittsburg Piping & Equipment Company.

Construction of the mercury boiler presented an unusual welding job as can be realized from an accompanying illustration. Porcupine tubes to the number of 3,080 on the seven horizontal parallel drums of 30-in. welded pipe had to be welded inside the drums and this necessitated forced blower ventilation. Only two of the joints leaked under test. Other large units code-welded in the shop were the governor and safety valve body for the mercury turbine and the mercury turbine condensers. The mercury liquid heaters and the mercury furnace walls were both shop fabricated; the overflow pipe connections of the former are shown in an illustration, which also shows some of the complicated pipe welds that had to be made.

The piping involved carries liquid mercury, mercury vapor, steam at 400 lb., 750 deg. F., water at 600 lb. pressure, as well as others for oil, gas, pulverized fuel and air. In general the pipe is extra heavy, ranging from 1 in. to 18 in. in diameter. Flanges were avoided wherever possible, flangeless valves were used and long radius bends prevail at the turns.

A mile and a half of welded pipe steam lines between the power station and the General Electric Works convey steam for heating, turbine testing and manufacturing purposes from the new station to distributing points in two older power stations used as distributing manifolds. The total length of line is 3,735 ft., requiring 4,865 ft. of 14-in. high-pressure lines and 4,433 ft. of condensate return lines mostly 8 and 10 in. Steam is delivered at the plant at 400 lb. and 750 deg. F. at a maximum rate of 650,000 lb. per hour.

Both steam and return lines are carried in a reinforced concrete tunnel. Short sections where entry is made to the old power stations are carried on skeleton bridges, because they cross various obstructions that preclude the use of tunnels. The temperature rise to 750 deg. F. involves, in the 4,865 ft. of 14-in. pipe, a total linear expansion in the neighborhood of 30 ft. with a potential pipe thrust of 400,000 lb. Without insulation, the radiation at 750 deg. F. would be the equivalent of more than 20,000 kw. total mercury turbine output. These figures make evident the responsibility of the anchorages, expansion joints, welded joints and insulation.

Pipe rotated in welding joints

HIGH-PRESSURE pipe rotated in welding joints is seamless, has a half inch wall and the 35-ft. lengths weigh about 2,300 lb. These were tack-welded to form 200-ft. lengths and the welding of the joints was completed as the sections were rotated. Position welds joined them to flangeless slip expansion joints, which in turn were welded to H-section embedded in the tunnel side wall, thus providing a rigid anchorage. Self-sealing packing is used under light mechanical pressure as the steam pressure tends to press the truncated-cone rings against the pipe. Each joint provides for 18 in. expansion, of which from 14 to 18 in. is actually used. During the transition period it was necessary to deliver steam for heating factory buildings as the boilers were being removed from one old station. This necessitated immediate insulation of the pipes as the bare pipe radiation would have dissipated most of the heat. The insulation was completed before the joints were tested and upon applying the 225 lb. pressure then available no leaks developed.

Stands for the weld-fabricated expansion roller sup-

*Excerpts from papers presented at a recent joint meeting of the New York chapters of the A.S.M.E. and American Welding Society, by R. H. Rogers† of the General Electric Company and H. M. Priest‡ of the U. S. Steel Company and formerly of the American Bridge Company.

Station Needs

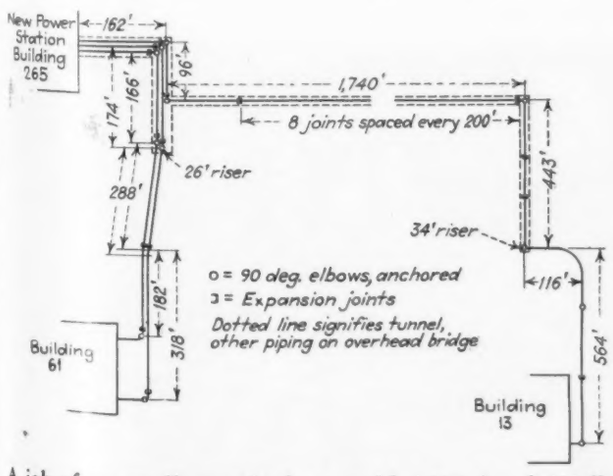
Porcupine boiler tubes being arc-welded in one of the seven horizontal mercury drums

The flexible tube is connected to a blower which helps remove the gases produced in welding to protect the men at work in the drum.

ports located under the pipe throughout the length, at 25-ft. intervals, were fabricated in place. The pipe was brought in through the hatchways and hauled to location on trucks. Fusion rings 1 in. wide by $\frac{1}{8}$ in. thick, rolled from strip, were tack-welded in the delivery end of each pipe, the welds being made at the inside edge of the ring within the pipe. The lengths were then lifted onto the stands and placed on temporary roller dollies. Six lengths with the last one cut make approximately 200 ft., including the chromium-plated sliding section in the expansion joint. These were strongly tack-welded together at six points on each joint. A split gear was clamped on and the 200-ft. length was rotated at about one revolution in six minutes, or at a peripheral speed of a little over 7 in. per minute by a small adjustable-speed motor operating through a gear reducer and chain.

WELDING of roll joints involved five passes using heavily coated G.E. W-21 electrodes, starting with $\frac{3}{16}$ in. at 200 amp. and finishing with $\frac{1}{4}$ in. at 275 amp. After each pass the slag was chipped of with an air tool which provided some peening effect. The first pass was laid straight and succeeding passes were oscillated increasingly as required to fill the 60 deg. beveled groove. The last pass was slightly crowned and was about $\frac{3}{4}$ in. wide. Welding was all done by hand, using the single operator type of motor-generator welding sets.

Only one position-weld was required at each expansion joint, that being where the 200-ft. line was welded to the stationary member of the expansion joint. These position welds were made with G.E. W-20 electrodes in four passes. The weld passes were started at the bottom of the joint and finished at the top, alternating the halves. Succeeding passes were started and finished at staggered points to prevent concentration of starting and finishing joints.



A job of no small magnitude to weld 4,800 ft. of 400-lb. and 750-deg. F. steam pipe 14 in. in diameter and 3,000 ft. of steam condensate pipe 8 in. in diameter

After the position welds, the roller dollies were removed and the roller support members were welded to the underside of the pipe and to the stands. Two types of support are illustrated. The expansion joints were then anchored by welding. Fitted blocks were welded between the embedded H-section and the joint anchorage bases. The 8-in. and 10-in. water pipe was handled in the same manner as outlined above except that the expansion joints were spaced 400 ft. apart.

Specifications covering in detail the entire welding procedure were rigidly adhered to throughout the fabrication of these pipe lines. It is significant that not a single leak developed under steam among the great number of roll welds and horizontal and vertical position welds. The electrodes used on the pipe and accessories amounted to 2,155 lb. The welding was 3 per cent of the cost of the line exclusive of tunnel and bridge construction.

ENDEAVORING to secure accurate data on the characteristics of arc-welded pipe joints the General Electric Company last year conducted a series of tests on standard 6-in. diameter pipes and the following conclusions were drawn as applying to pipe joints in buildings:

1. Arc-welded pipe joints have physical characteristics superior to pipe joints made by other methods, and freedom from slag inclusion and porosity come well within the A.S.M.E. Boiler Code requirements.

2. Heavily coated electrodes are to be preferred over bare or lightly coated electrodes because the quality of welds is better.

3. The use of fusion rings is not absolutely necessary as shown by the tensile strength for roll welds made with and without fusion rings under duplicate conditions.

Overflow connections on mercury liquid heaters of mercury boiler illustrate difficult pipe welds

It is probable, however, that welders would more readily succeed in making better quality welds with fusion rings on a production basis since 100 per cent penetration is more nearly assured. It is recognized that fusion rings have the disadvantage of resisting flow, a condition less serious in larger diameter pipe, and it is probable that they will not be used to any large extent in welding heating systems for low-pressure operation. In these cases the joint strength lost by incomplete fusion will be somewhat compensated for by the usual weld metal crown or reinforcement of the joint circumference. For securing the best quality consistently, the straight butt joint with fusion ring is to be preferred over other types of joints for 6-in. pipe.

4. Two passes instead of three are to be preferred on this type of pipe joint due to the saving in time and expense. The difference in strength is negligible.

5. Position welded joints made with fusion rings are closely comparable in strength to roll welds made under similar conditions.

6. The ductility of all types of welded pipe joints made with the electric arc and heavily coated electrodes approaches that for the pipe material more closely than does any other type of pipe joint.

7. The density of the weld metal is comparable with that of the pipe and the resistance to impact and corrosion is greater.

Structural welding features

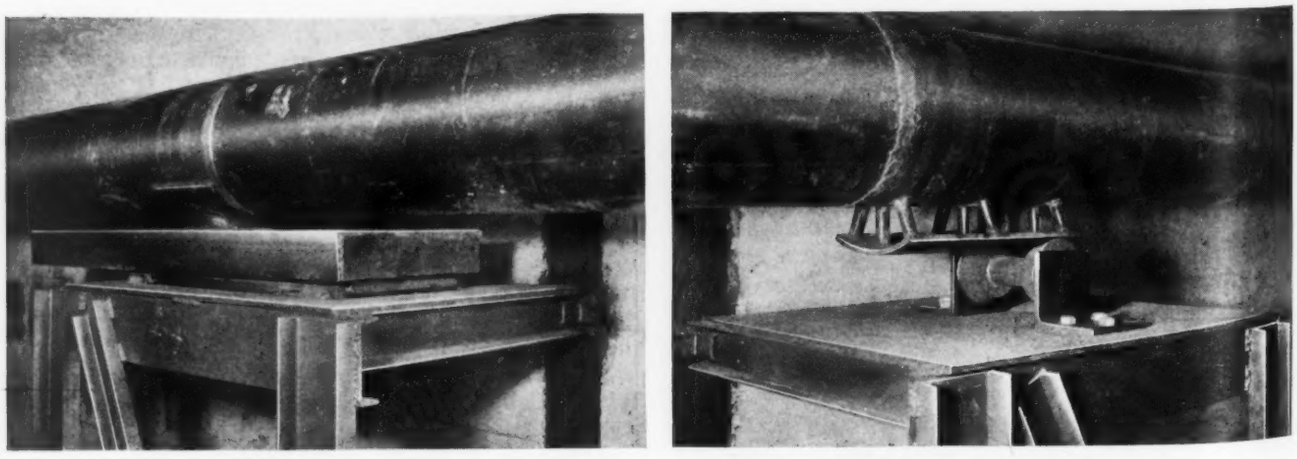
ALL structural steel was either shop or field welded, including the building structure, stack and bunkers, boiler supporting trusses and crane runways. The American Bridge Company designed the welding and fabricated and erected all structural steel. In general, standard steel procedure was used with the exception that rivets and bolts were entirely supplanted by arc welds. The most important or unique members were the two trusses to support the mercury horizontal drums, each of which supports approximately 1,260,000 lb. On each truss there is 450 ft. of welding which is chiefly $\frac{1}{2}$-in. fillet welds. The remainder of the structure is fabricated chiefly of $\frac{3}{8}$-in. fillet welds, with some 5/16-in. welds on the stack circumferential welds which necessitated odd position welding.

The total welded tonnage was 300 tons in the stack and bunkers and 1,100 tons in the remainder of the building. It is of interest, perhaps, that the stacks surmounting the bunkers and induced draft fan inclosures to a height of 190 ft. above ground were designed for a wind load of 25 lb. per square foot of projected area.

Fuel Rate Cut to 1.47 Lb. per Kw.-Hr. in 1933

Efficiency in the use of fuel for generating electricity continues to increase. A preliminary report by United States Geological Survey on operations of public utility plants during 1933 states that the generation of 50,641,000,000 kw.-hr. consumed 30,581,585 net tons of coal, 9,887,988 bbl. of oil and 102,600,000,000 cu.ft. of gas.

The coal equivalent of these various fuels was 37,-



Roller and slider supports and welded butt joints on 14-in. steam main

Left—A compound multiple collar support which permits rolling, but prevents twisting. Right—Ordinary roller support

156,000 tons. Deducting output from wood leaves 50,509,000,000 kw.-hr. produced from the other fuels, at the rate, therefore, of 1.47 lb. per kw.-hr. The saving of 0.03 lb., or about one teaspoonful per kilowatt-hour from the rate of the preceding year, is equivalent to 750,000 tons of coal, which at $3 per ton amounts to $2,250,000, the Survey report points out. In 1919 the rate was 3.2 lb. per kilowatt-hour. If there had been no improvement the energy from fuel would have called for 81,000,000 tons in 1933. This is considerably more than twice the quantity actually burned.

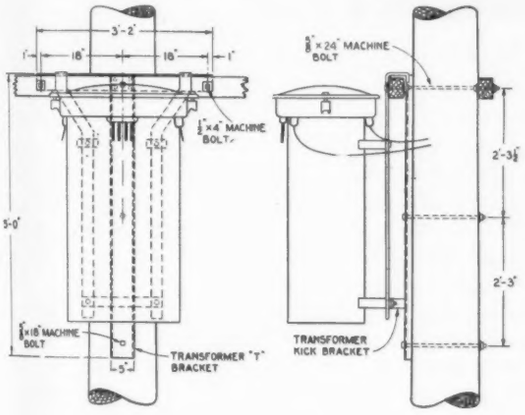
Regional figures in the report show that half the gas and more than half the oil were used in the West South Central States, although that region produced only 4,050,013,000 kw.-hr., or 8 per cent of the total fuel-generated energy.

Steel for Mounting Distribution Transformers

By G. J. HAUSMAN
Union Gas & Electric Company, Cincinnati

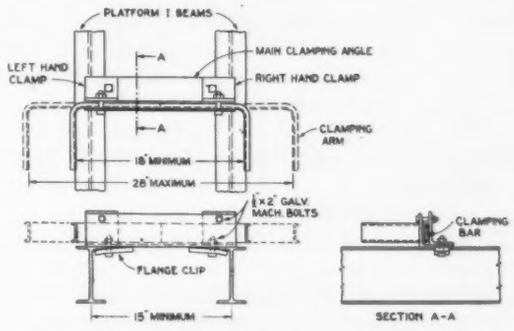
For distribution transformers of the larger capacities, too heavy to be hung in the usual manner on wood crossarms, steel can be used as an auxiliary to good advantage. Means for using steel advantageously for this purpose have been worked out by the Union Gas & Electric Company and, as shown in the accompanying illustrations, are now standard for 2,400/4,150-volt transformers.

Both the long and short steel platforms are of the same general type, consisting of I-beams of sufficient strength to carry all weight without bracing. All wood members and planking have been eliminated, thus reducing the hazard of fire due to burning of oil-soaked planks under the transformers. The use of these galvanized steel supports also has the advantage of full salvage value in the event service is discontinued. The possibility of transformer shift due to vibration has been eliminated by the use of a specially designed transformer base clamp as shown in the accompanying illustration.

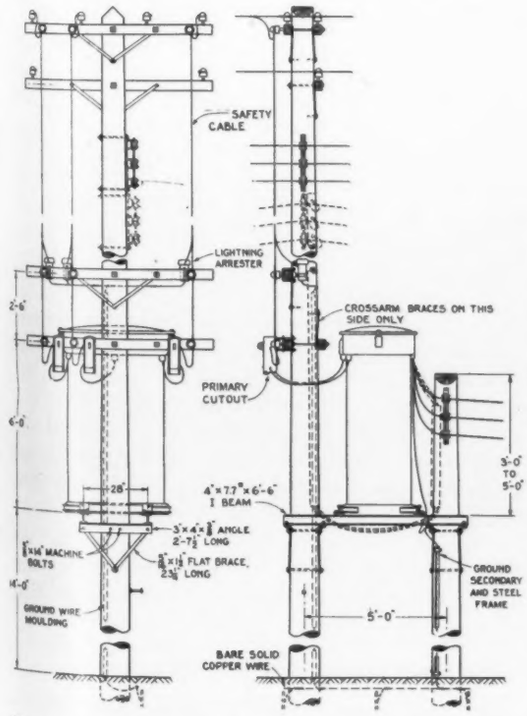


T-shaped steel support carries the weight of the the transformer

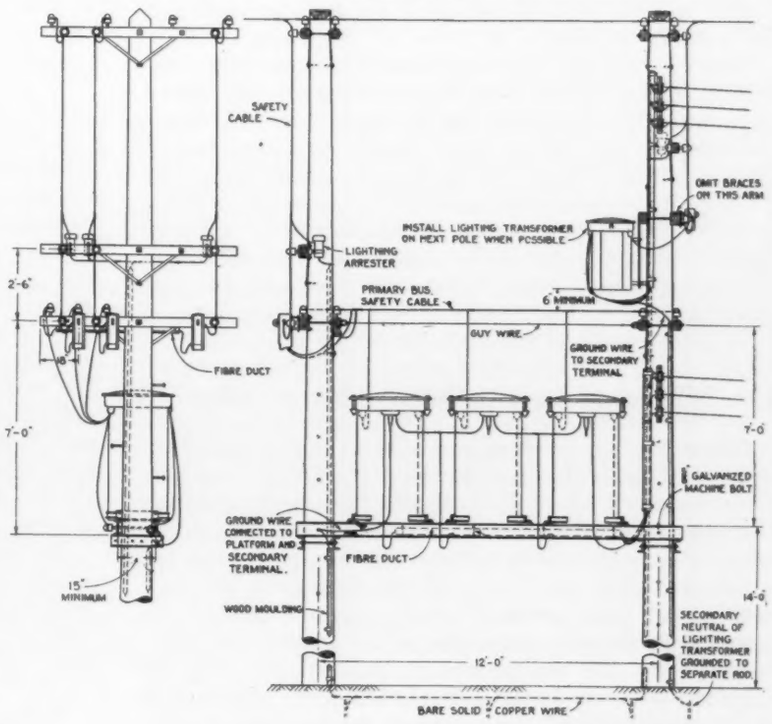
Used for all single-phase and three-phase transformers from 37½ to 75 kva. inclusive. Support is attached by three machine bolts through the pole. Same type also used for heavy constant - current street-lighting transformers.



Two adjustable base clamps prevent transformer shift from vibration causes



Short steel platform used for all single-phase and three-phase of 100 kva. and larger



Larger steel platform for two or three transformers up to a total of 300 kva.

Moratorium on Science Would Be Fatal to Recovery

Science has made more and better jobs than it ever eliminated, agreed speakers of the caliber of Drs. Jewett, Millikan and Karl Compton last week.

This is the answer of the world of science to the insidious trend in NRA codes toward checking the adoption of improved mechanisms and methods in industry.

Science is not the bedeviling cause of depression, but the angel to lead us out.

"NOTHING short of calamitous," is the vigorous answer of scientists to the trend in NRA codes and labor circles toward imposing a moratorium on science and invention. This insidious fallacy seems to be gaining ground with dangerous rapidity and is causing real concern among sober thinkers. Even the President has shared the concern to an extent by saying that "the fruits of current scientific thought and development, properly directed, can help revive industry and the markets for raw materials." This was addressed to a joint meeting of the American Institute of Physics and the New York Electrical Society in New York last week. The speakers are all members of the President's Science Advisory Board: Dr. Karl T. Compton, chairman of that board and president of Massachusetts Institute of Technology; Dr. R. A. Millikan, Nobel Prize winner and director of California Institute of Technology; Dr. F. B. Jewett, president of Bell Telephone Laboratories.

Only a stagnating society could follow any determination to mark time in physical science while the social sciences and the rest of the world are given time to catch up. This was the assertion of Dr. Millikan. Science has always made more and better jobs than those which were eliminated by competitive advances. Likewise, Dr. Compton insisted that every branch of science could be shown to have contributed to a preponderant influence for good of mankind.

Owen D. Young, in a letter read to the audience, said this fallacious notion was characteristic of all depressions when they approach the recovery stage. It seems necessary to find the evil spirit and cast it out. Sometimes a national figure is picked as the devil, sometimes a form of government succumbs, sometimes an economic system is chosen as the victim, and quite often scientific advance comes under proscription. As for picking on scientific advance, it was his opinion that science is far more likely to be the angel that will lead us out than to have proved itself as the devil that led us in.

Dr. Millikan: Science Makes Better Jobs

Science and its applications have so increased the efficiency of labor that here in the United States we produce more of the fundamental foodstuffs, clothing, building materials and fuels than we, just now, know what to do with, and in spite of the present jam in our social machinery which we call the depression the great bulk of all thus produced goes now, and always has gone, to the common man; that is, the laborer. So nearly is that true that any economist will tell you that the standard of living in the different countries of the earth is in general directly proportional to the total productivity of these countries per inhabitant.

I need bring forth no figures to convince anybody that the productivity of labor, brought about by the applications of science in America, has opened up to the common man the opportunities of leisure such as he has never known at any other time or place. When in history has a 40-hour week for the common laborer ever been heard of before? And what glorious vistas of a heretofore undreamed of civilization—civilization for the many instead of for the few resting on the backs of the many, as was the case in Athens—can be seen ahead if we can only teach the common man to use that leisure for his self-improvement instead of for his deterioration, as he does so often now! This is where our secondary educational system has its great opportunity.

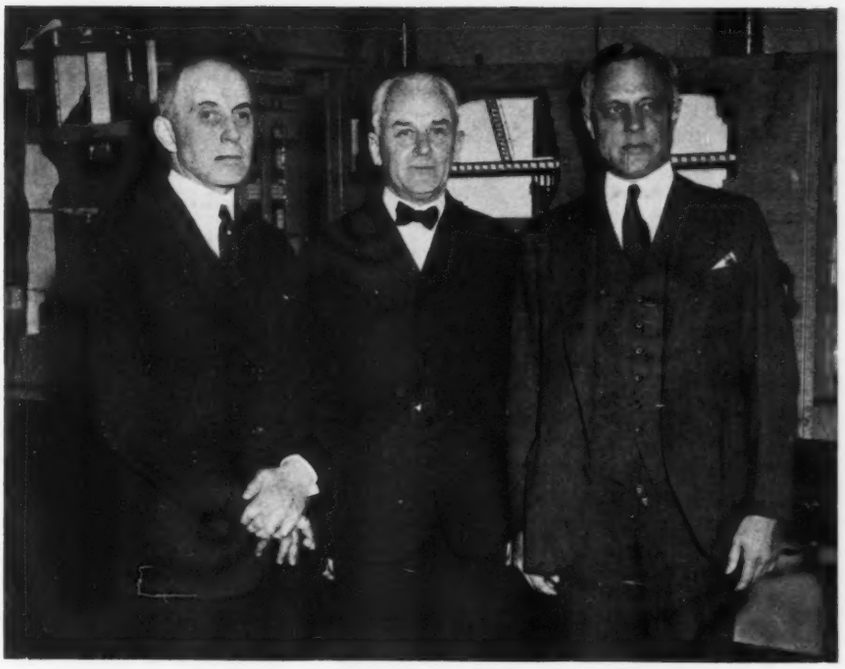
About the foregoing contributions of science to our civilization, there will be no controversy. But now comes the question upon which the public mind has become much confused because of men who do more talking than they do thinking. These men say "science is responsible for unemployment and therefore for the depression. Science through labor-saving devices is all the time destroying jobs by means of which men live." The answer to this charge is true, but, like most delusions, it is only half the truth, and therefore fundamentally false. The other half is that every labor-saving device creates in general as many, oftentimes more, jobs than it destroys, and the new jobs are in general better for the individual affected and much better for society as a whole than the old ones. Labor-saving devices do not in general destroy the jobs that demand intelligence. They cannot do it. The heavy, the grinding routine, deadening jobs are the ones that machinery destroys.

Progress of civilization consists primarily in the multiplication of human wants. If you want a stagnant civilization you have only to destroy the influences that cause these wants to multiply.

Census shows steady rise in employment

Taking the long range view, I have no hesitation whatever in saying that there is no such thing as technological unemployment. By what authority do I say

Better jobs and more jobs for workers is science's promise to industry



International

F. B. Jewett R. A. Millikan Karl T. Compton

that? By authority of the official census of the United States. This lists every decade the percentage of population "gainfully employed." This was 34 per cent in 1880, and almost exactly 40 per cent in 1930—a depression year—and it had shown a steady increase decade by decade save for a negligible drop for 1920—when war conditions were still on—to 1930. In other words, in this precise period, during which science has been applied most rapidly to industry, the percentage of our population living by means of jobs has continuously increased—comment enough on the soundness of the judgment of those who attribute the depression, which seems to me to be in fact a purely social phenomenon, to technological unemployment.

The idea that it might be wise to let development of the natural sciences wait until the social sciences have caught up is another idea, in my judgment, that rests upon very muddy thinking. Why? Because it is the change in the conditions of living brought about by developments in the natural sciences that very often makes possible an advance in the social sciences. Once stop the development of the natural sciences and the chief stimulant to the progress of civilization disappears and at the same time the social sciences will begin to stagnate also.

Political manipulation may destroy for a time the social effectiveness of such an advance, but it cannot be destroyed for long. Men may come, and human laws may change with the whim of legislators and their supporting public opinion. That is the sad thing about social progress. It may, and often does, go backward instead of forward—but that part of it which rests upon the changes in the life of man due to physical discoveries and developments, that remains immune from political and all other human influences, for its unchanging laws are written in the heart of the universe and progress here is the sure possession of all ages yet to be.

Perhaps the natural sciences are themselves the most enduring and the most effective of the social sciences. Let that thought sink deep into the mind of him who would stay their progress . . .

Dr. Compton: Science Makes More Jobs

The idea that science takes away jobs, or in general is at the root of our economic and social ills, is contrary to fact, is based on ignorance or misconception, is vicious in its possible social consequences, and yet has taken an insidious hold on the minds of many people. Conscious of the fallacy of this idea, but characteristically intent on their work and averse to publicity, the productive scientists of the country have thus far taken little or no part in discussions of the subject.

It has become evident, however, that the spread of this idea is threatening to reduce public support of scientific work, and in particular, through certain codes of the NRA, to stifle further technical improvements in our manufacturing processes. Either of these results would be nothing short of a national calamity, barring us from an advanced state of knowledge and standard of living and soon placing us at an economic disadvantage in respect to foreign countries which have not let themselves be swayed by such a shortsighted point of view.

We might select any or all of the effects of science on human welfare as the chief point of our discussion tonight. We might, for example, call attention to the effects of medical science. Where would we be today without medical science, which has one by one eradicated or brought under control those diseases which used to plague mankind and occasionally to decimate his numbers? Before the days of science these were thought to be the results of the displeasure of gods and demons. Where would we be today without the sanitary engineer who safeguards our milk supply and provides a safe and plentiful water supply and disposes of our garbage?

We might, for example, call attention to modern science in communication and transportation. Would any one like to go back to the days when the only communication was mouth to mouth or by posthorse mail carriage, and the only travel was by foot or horse or crude canoe? Would you like to give up the comforts and conveniences of your modern home, or the thousand and one things which add interest and pleasure and safety to life, which are products of science?

Think for a moment where we would be if our ancestors, alarmed by the progress of science, had taken steps by codes or by public sentiment to stop its progress! You now would be lacking in these things which I have mentioned. And if we, in this day and generation, act to stop science, our descendants will similarly miss the corresponding new advantages which they might otherwise have.

Do not be tempted to think that we are now in a unique position, that these social and economic problems have been suddenly thrust upon us by science or that science has done what it can for mankind and had better stop. Back in ancient Rome the labor unions were struggling with hours of labor, wages, scab labor just as we are today. Even back in 1600 Bacon described our present economic and social problems and anticipated some features of the New Deal with remarkable accuracy.

That great human benefactor Pasteur, grasped the truth when he wrote: "What really carries us forward is a few scientific discoveries and their applications."

The effect of science upon employment is a very live issue in these days of unemployment. It is here that a misunderstanding of the effects of science is likely to be most dangerous, because of possible political influences. Let us therefore consider very briefly what these effects are.

We will immediately admit that technological advances frequently result in labor-saving devices which throw large numbers of men and women out of work. This is distinctly unfortunate. Its evil effects can be mitigated by wise handling of these new devices, as, for example, the American Telephone & Telegraph Company has handled its introduction of automatic switching so as not to throw employees out of work.

But the other side of the picture is immensely more significant in that the major result of science is the creation of entirely new industries which cater to new human desires, and which not only create a multitude of new jobs but which increase the per capita productiveness of men so as, first, to permit of an increasing population which is not limited by starvation and misery and, second, to reduce the hours necessary for men to labor to produce their necessities, and in this way to give them their opportunity to appreciate and experience some of the better opportunities of living which formerly were available only to those of wealth or of politically favored position.

Let me give a few examples of what I mean: Two years ago was celebrated the centennial anniversary of the discovery of the principles of electromagnetism which underlie practically all of the modern electrical industry. According to the 1930 census there were in this country about 360,000 persons employed in the manufacture of electrical machinery and equipment and about 676,334 people employed in the distribution of electrical materials, exclusive of the field of communication, namely, the telephone, telegraph and radio, which contribute in addition an immense number of workers.

Previous to the days of the automobile the 1900 census lists 976,000 individuals employed in the carriage and wagon industry, as manufacturers, drivers, draymen, livery stable managers, blacksmiths, etc. Thirty years later, with the advent of the automobile, based on innumerable scientific discoveries and engineering developments, the census lists 2,409,394 individuals engaged in this industry, exclusive of those involved in oil production. These figures have been corrected to allow for the increase in general population in the same interval. They show that while the advent of the automobile produced technological unemployment among carriage and harness makers, yet the net result for labor has been a 250 per cent increase in the number of jobs.

I simply ask the question of where and when our serious unemployment problem should have struck if thirty years ago, to restrain technological unemployment in the carriage and wagon industry, legislation or codes had been enacted which would have inhibited the development of the automobile industry. Such an action would have eliminated the source of income which now supports about 10,000,000 people of our population.

I believe, however, that the argument can be made more fundamental even than this. Man has an irrepressible curiosity for new knowledge. This is the fundamental basis and urge for scientific work. Man has also an irrepressible desire to use his knowledge for the accomplishment of his desires. This is the basis of invention and of engineering. These, I believe, are so fundamentally a part of human psychology that they cannot be fettered, though their free exercise may of course be hampered or, on the other hand, be encouraged.

I believe that in the last analysis the extent of man's employment is governed by man's inherent desire and urge to do something. If science can relieve him of the more routine tasks, he is free to turn his attention to other things which excite his curiosity or satisfy his desires. In the last analysis, therefore, I believe that science simply increases man's power and the range of his activities. Most certainly, however, both theory and experience prove more conclusively that science has made jobs, not taken them away.

DEAR DR. COMPTON:

The value to civilization of scientific thought and research cannot be questioned. To realize its true worth one has only to recall that human health, industry and culture have reached, in a century of progress, a far higher state than ever before.

The idea that science is responsible for the economic ills which the world has recently experienced *can* be questioned. It would be more accurate to say that the fruits of current scientific thought and development, properly directed, can help revive industry and the markets for raw materials.

Very truly yours,
FRANKLIN D. ROOSEVELT.

Depreciation Accounting Imposed by New York Commission

Incidental to revising accounting procedure of the utilities so that the ends of regulation will best be served, New York's commission dictates the adoption of straight-line depreciation accounting. Mere retirement charges are, in its opinion, insufficient to preserve the integrity of property values.

The utilities call the ruling fallacious and see in it only higher costs of operation, unnecessarily high dormant funds and higher rates to the customer with the temptation to demand an equity for his higher rate.

RETIREMENT accounting, in contrast to depreciation accounting, is followed by the great majority of electric utilities. It is the practice in many states whose commissions have conformed wholly or closely to the uniform system of accounts of the National Association of Railroad and Utilities Commissioners. This dates back to 1923 and was prepared with the co-operation of the accounting section of the former National Electric Light Association. This is all on the point of being changed, if past national experience in regulatory circles is any guide, because Wisconsin and New York, always the forerunners in regulatory technique, have declared in favor of straight-line depreciation accounting.

On January 1, 1934, the electric utilities of New York State were under commission orders to begin operating under a new accounting code which, in addition to prescribing service-life or straight-line depreciation accounting, institutes several other drastic departures from prevailing practice. "Fixed capital" becomes "operating property account." There is more detailed segregation of property into generation, transmission, distribution, etc., and into service areas and political subdivisions. A perpetual or continuous plant inventory record is prescribed.

From time to time pronouncements of Chairman Maltbie and other members of the New York Public Service Commission and former Commissioner Lilienthal of Wisconsin have emphasized their belief that utility accounting should directly serve the purpose of regulatory administration. This is one of the fundamental urges behind the newly prescribed accounting. In past cases commissions have often given minor prominence to book values as against current appraisals. In the future the costs and delays of decisions occasioned by the time and effort so required are to be avoided by having the utility accounts so conducted as to reflect the current status of the company and thus aid the commission in looking at its values and operating figures from the rate regulatory angle.

This, briefly, is the background. But the measures taken are felt by the companies to be drastic, unsupported by law, complicated and costly in execution. The brief of the New York City companies attacks the ruling as beyond the statutory power of the commission, condemns the straight-line depreciation theory as fallacious and unsound and asserts that certain retroactive features would amount to confiscation without due process of law. It further denounces the intrusion upon the prerogatives of managements and asserts that the prescribed accounting will be prohibitively costly. A petition for rehearing has been filed.

Wisconsin expounds straight-line theory

Most prominent among the requirements of the new system are the straight-line depreciation and the perpetual or, rather, continuous plant inventory. The fullest exposition of the virtues of service-life depreciation as contrasted with retirement accounting are found in "Depreciation, a Review of Legal and Accounting Problems," prepared by the staff of the Wisconsin Public Service Commission at the request of the National Association of Railroad and Utilities Commissioners. It was presented at the recent convention by John H. Bickley, chief of the division of accounts and finance. The whole discussion is directed at the two practical questions that confront the commissions in every rate case:

1. How much accumulated depreciation should be deducted, if any, in determining the rate base?
2. What annual allowance for depreciation in operating expenses is reasonable and desirable?

It is argued in the report that annual accruals of depreciation and the annual operating-expense allowance for depreciation are one and the same thing. Confusion on this point leads to a definition of depreciation, thus:

"Depreciation may be defined as the consumption of the investment in property, or the loss in the service capacity of property, due to use, wear and tear, physical deterioration, the current action of the elements, obsolescence, inadequacy, or the demands of public authority. Briefly, it results from the usual forces and conditions which limit the service life of property and cause its retirement."

The sinking fund method, in which interest on the accumulating annual increments helps build up the requisite total at the end of the service life, is not as highly favored in the report as the straight-line method because of the greater complexity in accounting. In contrast with either of these there are (1) retirement accounting, (2) renewal expense accounting and (3) amortization of debt. In spite of the insistence of utilities that in a mature property the retirement losses are regular and fairly predictable, the Wisconsin staff calls the method "financially risky or suicidal from the long-run point of view, as

many owners of street railways might now admit." Evidently the commissions are trying to prevent the household group of utilities from facing the fate of all track transportation utilities, whose financing and accounting policy has been more or less a perpetuation of fixed capital values.

Renewal expense accounting not favored

Renewal expense accounting is even less favored because no advance provision whatever is made, the write-off occurring only as renewals are necessitated. Amortization of debt is viewed as no equivalent of depreciation accounting because funded debt should never be as great as the plant value and because the life of the debt bears no simple relation to the composite life of the property.

Further than this, the base on which depreciation is figured, as well as the operating plant account, should be original cost and not replacement cost, otherwise rates to support operation, including adequate depreciation allowances, would, in the opinion of the Wisconsin staff, have to fluctuate with price levels. In times of high prices the consumer would be contributing to the equity of the investor, which the Wisconsin and presumably the New York boards believe to be unjustifiable. Also, there is no sure way to estimate any future level of replacement cost. Incidentally the briefs of the New York City companies insist that the same difficulty arises with the salvage value and the service life which fix the annual rate of straight-line depreciation.

On the whole this highly controversial question seems to be going through the same changing of sides that has taken place with valuation theories. During the long era of rising prices since the turn of the century the utilities held out for reproduction values and the commissions for prudent investment and original cost as values. The commissions quite often belittled the estimates of engineers as to service lives, per cent conditions and rates of annual depreciation as mere guesses, no two of which were alike, any more than were their corresponding estimates of reproduction-new values. Now the commissions wish to discard the known and demonstrable experience of the companies on annual replacements and, in its place, require the distortion of operating accounts to reflect depreciation founded on an identical technique of estimation and conjecture. The utilities say the prescribed procedure is more vicious than it otherwise would be if depreciation were entirely a matter of mere wear and tear and physical decline in service capacity. Obsolescence and plant changes forced by state and municipal improvements are dominating and wholly uncertain factors in service life depreciation.

Ever since the United States Supreme Court in 1878 criticised the practice of establishing depreciation reserves through periodic changes to operating expenses and held that only the actual expense of renewals could be charged to operating expense, the subject has been shrouded in conflicting decisions in the courts. The Wisconsin report suggests the following as a means of clarifying the judicial doctrines on depreciation:

1. The interdependence of accrued depreciation and annual depreciation should be recognized. Determination of accrued depreciation and the annual allowance are at best rational estimates which must be based on the same fundamental assumptions, if fair treatment is to be accorded the public and the companies. The estimates of experts as to accrued depreciation are based on certain assumptions of diminishing value, and it is clearly unreasonable to use one set of assumptions to determine fair value and another to determine the annual allowance. These matters are functions of one another, so to speak, and should be treated as such.

2. Depreciation reserves accumulated under regulation as an item of operating expense must not be violated by the judicial holding that they are free surplus. The only justification for their creation is that they are necessary or were believed necessary to reimburse the utility for consumption of property.

3. Estimates of the annual amount necessary to maintain the value of utility investment are subject to error. The correction of erroneous estimates must be made from time to time; otherwise, over a period of years, the reserve loses its proper relation to its original purpose.

4. Excessive or inadequate depreciation accruals should not be confused with excessive or deficient profits. Depreciation accruals are in no sense a part of corporate profits. Such accruals would not exist except as operating expenses, and to assume otherwise is merely to assume that there is no public utility regulation. The fact is obvious that, had a lower or higher rate of depreciation been reasonable, rates might have been reduced or increased by the same amount. This is the very basis of regulation.

5. If for no other than practical reasons, the original cost of depreciable property should be adopted as the depreciation base.

6. Depreciation reserves created out of charges to operating expenses under commission regulation should constitute the minimum deduction for accrued depreciation, and where the commission, after considering the past accruals and the financial history of the company, believes it expedient such reserves may also be the maximum.

7. Accrued depreciation should be deducted from fair value new in the same proportion that the book depreciation reserve, accumulated by charges to operating expense under regulation, bears to the book cost of the property, where the book depreciation reserve approximates the reserve requirement under the method used in providing for depreciation.

Utilities oppose departure from facts

IN COUNTERING these doctrines and prescriptions of the new accounting code the New York companies object strenuously to the injection into basic accounting records "by oblique methods" of "doctrinaire formulæ of depreciation and valuation which by their very nature must always be debatable. They have no place in accounting procedures which are aimed to provide *a record of basic facts* subject to positive verification." The proposed system is frowned upon because it results in charging the consumers for something they do not receive, setting up inordinate reserves and increasing costs of accounting. In substantiation of this claim an exhibit was filed which showed that had the plan been applied to the New York Edison Company in 1916 there would have been an actual increase of $39,000,000 in the cost of service during the seventeen years to 1932. In the absence of other authenticated values, it uses the percentage rates allowed in computing depreciation deductions for income tax purposes. A fund of $69,000,000 (approximately 25 per cent of the company's invested fixed capital) would have been accumulated, as against the accumulated retirement charges of only $43,000,000 actually made. During eleven of the seventeen years the straight-line method of depreciation would have occasioned (allowing 7 per cent return on depreciated investment at the beginning of each year in addition to operating expenses) a cost of service in excess (from 1 to 20 per cent in excess) of the gross operating revenue. With the actual retirement accounting practiced the apparent deficits occurred only during six years and the values ranged only up to 10 per cent (in 1918). The annual retirement expense has never exceeded 2 per cent of the fixed capital book cost. Depreciation accounting

would have made the annual cost from 6 to 12 per cent.

New York companies with more than $50,000 of annual electric operating revenue must begin the preparation of a continuous record of operating property subdivided so as to show separately the operating property located in each city, town or village. It must be completed within the next two years. Details shall agree with the operating property accounts on the books and original cost, actual or estimated, is prescribed. As far as possible (positively for subsequent additions) the date of installation and full identification shall be recorded.

Also separate records shall be maintained for the book cost of property comprising each electric plant owned or operated. The term "plant" means each separate generating station, substation, transformer station and transmission line and the distribution system located in each city, town or village. Likewise the operating and maintenance expense items shall be segregated except that groups operated as units may be lumped if impracticable to segregate.

"The amount of detail is appalling," is the comment of the companies on the requirement that the continuous inventory be kept and reconciled with the corresponding operating plant accounts. The United Electric Light & Power Company made a similar continuous detailed operating plant record at one time and it cost about $7.35 per $1,000 of fixed capital investment. It was found that it cost afterward 39 cents per $1,000 to keep the system going. On this basis it would cost the whole Consolidated Gas group of companies $6,115,835 to institute the system and $278,482 a year to keep it up. These figures are considered to be entirely out of keeping with any possible value that the commission or the company might find in such records. The Wisconsin system of accounts contains no corresponding mandatory provision for a continuous inventory.

All except very small companies shall keep books on a monthly basis of transfer to the general ledger. Depreciation entries shall be made monthly on straight-line basis.

Franchises and consents shall be carried at actual outlay values and written off when the franchises and consents expire.

Debits may be made to the account "contribution for extensions" only when contributions are repaid. No provision is made for adjusting this account in case property elements are retired.

Taxes on net income are excluded from the operating tax group as permissible revenue deductions. They are, like interest, to be charged to an income deduction account.

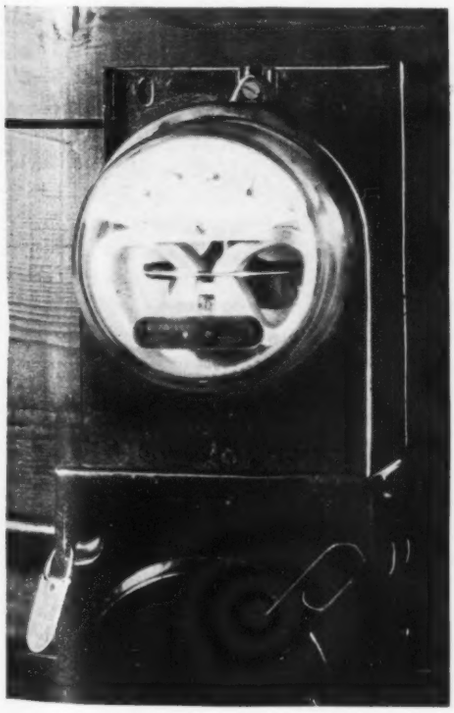
Other typical provisions of the new code

A work order or job order system shall be instituted for all projects in excess of $1,000 for Class A and $500 for Class B companies. All installations, additions, retirements and replacements shall be covered by a "work order estimate" and a "work in progress record." The work orders and supporting records shall be permanently preserved.

When a metered service is discontinued and the meter removed and not immediately replaced (except in the case of seasonal customers) the consumer's meter installation account shall be credited with an amount representing the actual or the average meter installation cost. When any meter installation previously retired is reused the retirement entry shall be reversed. Many simple meter changes will now involve an accounting entry.

Electricity supplied to officers or employees without charge or at less than tariff rates shall be included in operating revenue accounts at tariff rates with concurrent charges to the accounts to which the pay of such officers or employees is charged.

Greatly refined detail is required in connection with interdepartmental and intercorporate transactions, and especially with affiliates of any description for which precise definitions are set up.



Simple Shield Hampers Tampering

In places where there has been tampering with meter covers and cases a simple supplementary cover of sheet metal has sufficed to afford protection. As used by the Rochester Gas & Electric Corporation it covers the joint between cover and base and a portion of the glass cover in addition. In the few instances where the case has been subjected to puncture the addition of a loose spring-steel strip inside the stamped sheet-metal cover has served well to foil the use of drills.

The device has flanges which fit under the cover of the service and meter connection cabinet and cannot be removed without breaking the seal on this cabinet.

Stamped meter inclosure fits standard box and hinders diversion

What San Joaquin's Free Service Means

A. E. Wishon

Startling and refreshing, two subsidiaries of Pacific Gas & Electric offer a free service plan designed to build load. President Wishon has told why it was done and how it will be sold.

DETAILS of the new special inducement rate offered by the San Joaquin Light & Power Corporation and the Midland Counties Public Service Corporation in the form of two months free use of current have just become available. Briefly, for a two-month period, commencing with the April meter readings, domestic and commercial lighting consumers, upon approval of schedules by the Railroad Commission, will be given unlimited use of electricity for a monthly charge not to exceed the amount of the bills paid by them in March, ELECTRICAL WORLD, February 10, page 234. For the same two-month period agricultural power consumers will be given the right to use power in excess of that used by them last year at half price for the excess used, or under certain conditions at no additional cost.

Lower rates earned by energy use

Following the close of the two-month trial period, made possible by a temporary surplus of electric energy by the two companies, all domestic lighting consumers will be given opportunity to qualify for the low cooking and heating rate, and thus use more electric current without increasing monthly bills. The cooking and heating rate heretofore has been available only to those consumers having electric ranges and other large appliances. Each domestic and commercial lighting consumer will be notified the exact date on which unlimited use begins and ends, and also the maximum amount which will be charged regardless of the amount of electricity used. As meters are read continuously throughout the month, the unlimited use period for individual consumers will vary according to the date of their meter reading, but each one will have a full two months regardless of the starting date.

During April and May of this year agricultural consumers will be charged one-half the regular rate for all use in excess of the power consumption during the same period last year. If the total use for the 1934 agricultural year shall exceed 4,000 kw.-hr. per horsepower the companies will refund the amount paid for the excess use in April and May. Special provision is made for consumers who did not receive service in April and May of 1933.

Great advantage will accrue to domestic lighting consumers from provisions which permit these consumers to qualify for lower rates at the end of the two-month period of temporary unlimited use of electricity. Those consumers in this class who use as much as or more than the amount of energy used in the corresponding month of last year will be billed on the lower cooking and heating rates if the amount of the bill is not less than that paid last year, and otherwise the same amount as last year's bill. Consumers using fewer kilowatt-hours than last year will be charged the regular lighting rate. This will enable such consumers to use a certain amount of additional current without additional cost and the use of further amounts of electricity at a low rate, which drops with increased use to as low as 1½ cents per kilowatt-hour.

The following table, based on San Joaquin rates for incorporated territory, illustrates how the consumer will gain by the proposed adjustment of rates for domestic service. The table shows the number of kilowatt-hours that various amounts of money will buy under the domestic lighting (L) rate and the cooking and heating (D) rate, the free kilowatt-hours a consumer will get when he qualifies for the D rate and the lower cost per kilowatt-hour under the D rate:

Amount of Bill	Number of Kilowatt-Hours "L" Rate	"D" Rate	Increase	Per Cent Increase	Average Rate per Kw.-Hr. "L" Rate Cents	"D" Rate Cents
$1.85	30	30	—	—	6.18	6.18
2.30	40	43	3	7.5	5.74	5.32
2.75	50	56	6	12.0	5.50	4.92
3.20	60	69	9	15.0	5.34	4.65
4.10	80	95	15	19.0	5.11	4.30
5.00	100	121	21	21.0	5.00	4.13
5.90	120	147	27	22.5	4.92	4.02
6.80	140	173	33	23.5	4.85	3.94
7.70	160	233	73	46.0	4.81	3.30
8.60	180	293	113	63.0	4.77	2.93
9.50	200	353	153	76.0	4.75	2.69

San Joaquin consumers in rural territory and all Midland Counties consumers will benefit in a similar manner.

Benefits for present large users

The domestic consumer who already has a range and water heater will be able to secure a rate of 1 cent per kilowatt-hour after using 170 kw.-hr. per month by installing a load-limiting switch or double-throw switch between range and water heater.

It is believed that the new rate plan will give an immediate impetus to the sale of all types of electric appliances and equipment. An energetic sales promotion drive to build permanent load will be carried on by the two companies. In advance of and during the two-month period of unlimited use special effort will be made to have commercial lighting consumers increase wattage, install additional window lighting and modernize interior lighting. By doing this in advance of the unlimited use offer

consumers will get two months use of the added wattage without cost.

Active sales promotion will be carried on to induce domestic consumers to learn the great convenience of adequate light and liberal use of appliances during the unlimited use period. This work will be energetically followed up by further endeavor to build up domestic use so that consumers will permanently qualify for the lower cooking and heating rates.

President Wishon explains

In commenting on this experiment, A. Emory Wishon, president of both companies, has said: "The plan which has just been submitted to the Railroad Commission for approval has been carefully evolved after many months of study. The companies have a temporary surplus of power due to seasonal high water and decreased load. Business has been on the decline and we are in consequence earning less than was contemplated when rate reductions were effected in 1932. The company is in no position to stand a drastic reduction in income.

"What we have sought is a means by which we could give our customers more for their money and still maintain our revenues at a necessary level. The plan is based upon these simple facts and with the thought that this privilege of free use for a trial period will demonstrate the value of permanent use. Greater production per acre of land reduces unit cost of agriculture; greater quantity sales in merchandising make possible lower prices. The same is true of electricity. Our effort therefore is to increase permanent use.

"The surplus capacity making possible the unlimited use plan has been caused by a falling off of more than 150,000,000 kw.-hr. in system load. Therefore distribution system capacity, as well as generating and transmission capacity, is already available for this use."

Bureau of Standards on Economy Basis

Appropriations slashed by an effective 50 per cent, the national standards body has pared its expenses and eliminated least useful services.

Scientific and technical research is to suffer more than does commercial and safety code work. Further curtailment would be a serious loss to the industry.

THE appropriation for the Bureau of Standards for the fiscal year 1932 was $2,749,510. For the present fiscal year Congress appropriated $2,056,045, but of this amount more than $720,000 was impounded in accordance with the economy program, so funds available for expenditure are limited to $1,336,000.

Operating costs were slashed to a minimum, but the drastic curtailment of funds could be met only, in the final analysis, by severe reduction in the bureau's staff. Consequently, nearly one-third of its employees were discharged or given indefinite furloughs. On last June 30 the regular staff numbered 946 employees, while on December 1 the number was 657.

Salary cut 20 per cent

The numerous lines of work which the bureau is called upon to perform require the services of many men and women who are specialists in their particular fields. In order to retain those who were absolutely essential it was necessary to impose upon the members of the staff an additional departmental furlough of fifteen days without pay, so the bureau personnel is at present operating on a total salary reduction of approximately 20 per cent below base pay.

While the heavy cuts in the bureau's appropriation last July necessitated the curtailment of every line of work, there were certain activities which had to be supported at the expense of others and the director adopted a policy to retain the most essential and beneficial lines of work. Especially were efforts made to support the fundamental standardization work. It was also necessary to continue the testing for other government departments in order to determine whether equipment and supplies purchased under federal specifications conformed to the standards required.

The bureau also maintained the primary and essential service of calibrating thermometers, graduated glassware, gages, weights and electrical, optical and mechanical measuring instruments in terms of national standards when called upon to do so by scientific and industrial laboratories.

Just as important—and sometimes held even more important—was the necessity for answering the great number of daily inquiries for authentic technical information on every conceivable subject within the bureau's field. This is a service, according to bureau officials, which every citizen of the country apparently believes he is entitled to receive from a government bureau, irrespective of curtailment of supporting appropriations.

Faced with these and other services that had to be maintained, the burden of retrenchment fell still more heavily upon commercial standardization activities. The fund for investigation of problems of mutual interest to the government and to engineering societies and trade associations was cut to 12 per cent of that for 1932. The semi-factory scale work on levulose undertaken to provide a basis for the possible development of a national sugar industry through the cultivation of artichokes was discontinued. The laboratory for the investigation of the principles underlying the sensitivity of photographic emulsions was closed.

The branch stations of the bureau at Columbus, Ohio, and Tuscaloosa, Ala., were also closed. The master scale station near Chicago is being operated only one month during each quarter, instead of continuously, as heretofore. The work of the commercial standards groups, including the divisions of building and housing,

simplified practice, specifications and trade standards, was reduced to a skeleton organization.

But despite this curtailment in specific cases the greater part of the reduction had to be met by a general curtailment of the scientific and technical research of the bureau covering the development of new standards, the refinement of methods of measurement and the determination of physical constants and the properties of materials.

It was also pointed out that the ability of a member of the bureau's staff to speak with authority in his particular field comes in large part from his intimate contact with his subject through his laboratory work. Consequently, it was asserted, the opportunity to contribute through laboratory research to the advancement of knowledge in its particular field must not be denied to the bureau if its prestige and authority are to be maintained.

The work on commercial and safety standards was curtailed drastically by the economy advisory committee with the belief that this line of work could be continued by outside and private standardizing agencies. Many trade associations concerned, however, did not look favorably upon this idea, and at a general conference held at the Department of Commerce last October numerous urgent requests were made for the government to continue its work in this field. The department has made it known that it favors a partial restoration of the appropriation for this work. If this plan is looked upon favorably it will constitute the only probable increase in funds for next year the bureau will receive. On the other hand, there is a movement further to relegate commercial standardization and simplification to the American Standards Association. The chief point, however, is that the fundamental standardization work of the bureau should be maintained and the electrical industry, as well as the electrical engineers, should support this point of view in every possible way.

Instrument Transformer Corrections Made Simple

Accurate to within 0.05 of 1 per cent, this graphic aid for the meter engineer reduces necessary calculations to a minimum

By D. R. LAIB
Transformer Engineering Department,
Allis-Chalmers Manufacturing Company, Pittsburgh

Determination of the effect of phase displacement and ratio departures in instrument transformers entails considerable labor when mathematics only is used for its interpretation because the net accuracy must be calculated for each condition of secondary burden and for each load power factor. Curves have been drawn and constants tabulated in an effort to lessen this labor, but a recently compiled chart minimizes all calculations.

It is customary to plot the ratio and phase angle curves of instrument transformers in the form shown in Figs. 1 and 2. The ratio of either a current or voltage transformer is plotted as a percentage of the marked ratio.

If, for example, the ratio of a transformer at some particular point of operation is shown to be 99.8 per cent, it means that the ratio is 0.2 of 1 per cent low. The transformer, then, is delivering to the secondary terminals a voltage or current higher than the correct proportional value and the indicated result should be multiplied by 0.998. This assumes the transformer is used to step down voltage or current. In the case of a step-up transformer a low ratio would indicate the secondary current or voltage lower than it should be.

In the case of ammeters and voltmeters and in connection with most relay operation interest is centered in ratio only. When wattmeters and watt-hour meters are used the phase angle of primary to secondary voltage and current must also be considered.

The left vertical scale of the new chart (Fig. 3) is divided as to per cent of marked transformer ratio, corresponding to the ratio characteristic curve. The right vertical scale is divided into minutes of transformer phase angle. The remaining vertical scales represent power factors of the primary circuit and are assumed as lagging.

In the case of leading power factor it is only necessary

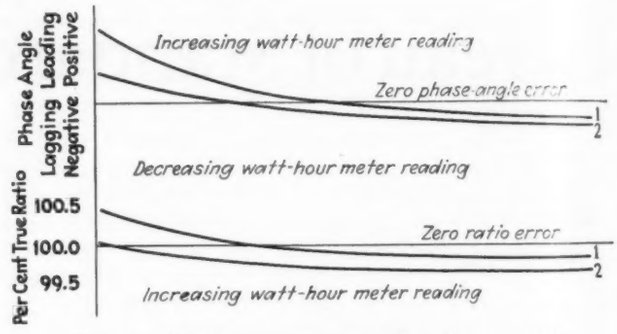


Fig. 1—Watt-hour meter reading decreased by lagging C. T. phase angle

By A.I.E.E. rules the phase angle of a current transformer is positive when the reversed secondary current vector leads the primary current vector. A leading angle increases and a lagging angle decreases the watt-hour meter (or wattmeter) reading.

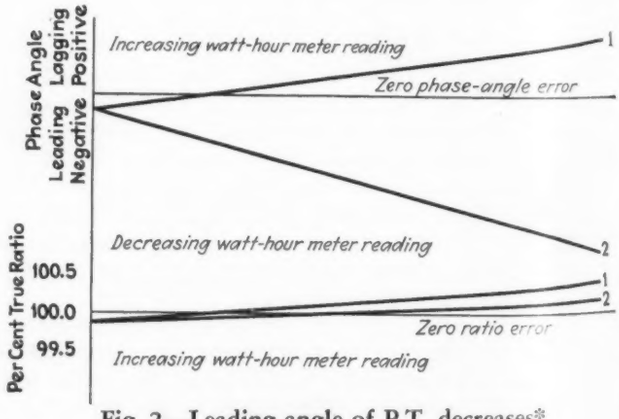


Fig. 2—Leading angle of P.T. decreases* wattmeter reading

By former A.I.E.E. rules the phase angle of a voltage transformer (P.T.) is negative when the reversed secondary vector leads the primary vector. A lagging angle decreases the watt-hour meter (or wattmeter) reading.

*EDITOR'S NOTE—Revision of the A.I.E.E. Standardization Rules (1933) calls for treating the phase angle of a voltage transformer *positive* when the reversed secondary voltage vector *leads* the primary vector.

As an example of use of the chart, assume a current transformer with a ratio of 100.25 per cent and a positive or leading phase angle of 12 minutes. Lay a straight edge connecting 100.25 on the left-hand scale and 12 minutes on the right-hand scale below the zero horizontal line, corresponding to a current transformer with positive (leading) phase angle. Where the line of the straight edge intersects the intermediate vertical scales there is indicated the resultant accuracy correction necessary for the various load power factors. At 95 per cent power factor, for instance, the wattmeter will read 0.13 per cent slow, or the meter reading should be multiplied by 100.13. At 60 per cent power factor (lagging) the wattmeter will read 0.23 per cent fast or the meter reading should be multiplied by 99.77 to give the correct power value.

Assuming a voltage transformer with a ratio of 99.8 per cent and a negative (leading) phase angle of 8 minutes, the 8-minute point in this case is above the zero line. Connect the two points as before and the corrections read for any load power factor will be those necessitated by the departures of the voltage transformer.

The combined correction when both C.T. and P.T. are used can be found with one setting of the straight edge. It is first necessary to add the ratio of the C.T. to that of the P.T. and then subtract 100. For the above illustration this establishes a new ratio setting of 100.05. Likewise, combine the positive angle of 12 minutes for the C.T. with the negative angle of 8 minutes for the P.T., obtaining a combined phase angle error of 4 minutes positive. Using the over-all ratio of 100.05 on the ratio scale and the over-all 4 minutes positive on the phase angle scale, the combined correction for both types of C.T. and P.T. errors may be read as the intersection of the straight edge line with the power factor line. Thus for 60 per cent power factor the combined correction is that for a meter 0.1 per cent fast. The meter registration is correct at about 92% P.F.

In this instance the combined effect of the two transformers gives less error than either one alone.

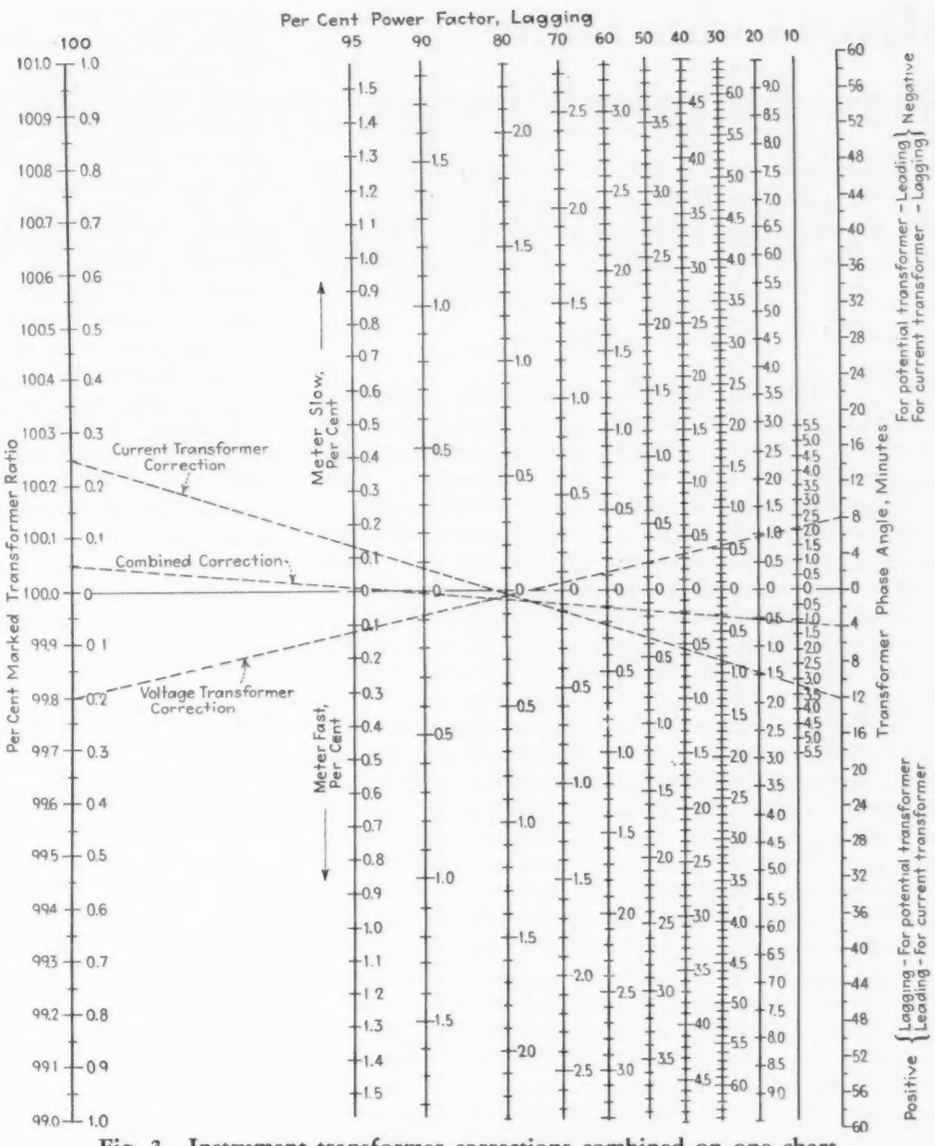


Fig. 3—Instrument transformer corrections combined on one chart

to remember to invert the right-hand column, interchanging the position of the positive and negative angles. There is a slight error in the chart in that the results are obtained by addition rather than by multiplication (the correct procedure), but in general the chart is accurate within 0.05 of 1 per cent.

Utilities Added 172,000 Kw. in 1933

Public utility power plant capacity increased by only 172,000 kw.-hr. during 1933, according to a preliminary report of the United States Geological Survey. At the end of the year the aggregate was 36,232,545 kw., against 36,060,593 kw. at the beginning. As is evident from the accompanying table, in several geographical regions there was a small net decrease, but this was outweighed by additions elsewhere, especially in the Middle Atlantic and North Central States.

The table relates to plants of 100 kw. or larger, and the number of companies includes only those generating energy, as distinguished from companies that are exclusively engaged in distributing energy purchased from other sources. It includes not only central stations but also electric railway and other plants.

Capacity of Generators in Power Plants Generating Electricity for Public Use

(United States Geological Survey

	January, 1933			December, 1933*		
Region	Companies	Plants	Total Capacity (Kilowatts)	Companies	Plants	Total Capacity (Kilowatts)
United States	1,543	3,864	36,060,593	1,537	3,813	36,232,545
New England	146	331	2,940,867	143	327	2,947,877
Middle Atlantic	155	423	9,176,571	154	427	9,251,169
East North Central	300	682	8,238,629	298	673	8,215,981
West North Central	361	736	2,653,143	360	737	2,674,586
South Atlantic	165	442	4,315,180	165	439	4,395,474
East South Central	78	220	1,718,029	79	221	1,673,724
West South Central	132	422	1,715,049	134	390	1,751,230
Mountain	128	312	1,189,260	127	309	1,190,074
Pacific	78	296	4,113,865	77	290	4,132,430

*Figures are preliminary and subject to revision.

Mixed-Color Lights Show Intensity Paradox

Add the foot-candles obtainable singly from two monochromatic sources of different hue and the resultant white light foot-candles is less than their sum, says the author. A matter of physiology, with a lesson for the illuminating engineer.

By I. J. SATTINGER

As far as the eye can judge it is possible to obtain a white light which makes most objects appear about the same as in natural daylight by combining mercury and neon luminescent tubes in suitable proportions. Such a combination of light sources is on the market today.

An interesting question is this: If two differently colored lights shine on a test plate at the same time, what is the resultant illumination as compared to the illumination furnished by each of the lights alone? Is this resultant equal in foot-candles to the arithmetical sum of the individual color components, or is it something less?

The answer is, unfortunately, that something in visual effectiveness, as measured in foot-candles and lumens, seems always to be lost by the merger of different colors of light. That is, N foot-candles of neon illumination and M foot-candles of mercury illumination impinging upon a white or gray test object produce, as far as the eye is concerned, something less than $(N + M)$ foot-candles of resultant illumination. Results of 21 tests showed a loss in visual effectiveness in every case.

In the case of light subjectively approaching that produced by mercury arc and neon tubes the ratio of effective resultant illumination to the illumination calculated by taking the arithmetical sum of the two components seems to have a minimum value, according to the tests conducted, of about 84 to 86 per cent. With equal orders of magnitude of mercury and neon light it may be found between 84 and 90 per cent, depending on the actual intensities of mercury and neon light used. For the combination of quantities giving subjectively white light, this ratio or "efficiency of combination" seems to vary in the same range, the best value probably being 88 per cent. Where one color of light is predominant it is apparent that the ratio approaches 100 per cent, which is the value attained with only one color present.

It has been general practice to compare efficiencies of lights by integrating areas under curves whose abscissas are wave-lengths and whose ordinates are relative luminosity or product of energy radiated and visibility factor for some wave-length. But does not the accompanying table, with its consistent deviation away from values obtained by addition and superposition, suggest that this procedure is incorrect?

It should be understood that the results herein discussed are only roughly approximate, for numerous difficulties were encountered in the measurements. Neon and mercury arc lamps were not used, because incandescent lamps provided simpler and more convenient manipulation and regulation. It was therefore necessary in using incandescent lamps to attach color filters, chosen to match respectively the light from the mercury arc and from the neon tube.

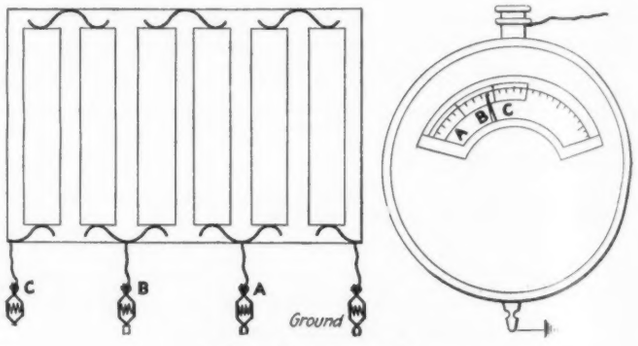
Loss of Visual Effect When Mixing Red and Blue Lights

Filter E5 (red) and E18 (blue) were furnished by the Pevear Color Specialty Company.

(1)	(2)	(3)	(4)	(5)	(6)
Foot-Candles Measured			Computed	$R+B$ Meas.	R Meas.
Blue	Red	$R+B$	$R+B$ (1)+(2)	$R+B$ Comp. (3)÷(4)	B Meas. (2)÷(1)
0.71	0.96	1.40	1.67	0.838	1.35
0.72	1.31	1.80	2.03	0.887	1.82
0.74	0.91	1.48	1.65	0.897	1.23
0.90	0.88	1.60	1.78	0.900	0.98
0.92	0.83	1.51	1.75	0.920	0.90
0.99	1.16	2.03	2.15	0.945	1.17
1.00	1.71	2.25	2.71	0.831	1.71
1.01	1.14	2.03	2.15	0.945	1.13
1.02	1.53	2.30	2.55	0.865	1.50
1.02	0.58	1.37	1.60	0.857	0.57
1.03	0.58	1.41	1.61	0.877	0.56
1.51	1.63	3.05	3.14	0.972	1.08
1.51	1.67	2.88	3.18	0.905	1.11
1.53	1.16	2.34	3.69	0.870	0.76
1.56	1.56	3.71	3.12	0.870	1.00
1.56	0.63	1.95	2.19	0.890	0.41
1.58	1.15	2.33	2.73	0.854	0.73
1.61	0.62	1.97	2.23	0.884	0.38
1.62	1.11	2.29	2.73	0.838	0.69
1.63	1.61	2.78	3.24	0.860	0.99
1.70	1.47	2.86	3.17	0.902	0.86

Simple, Low-Cost, Cable-Phasing Outfit

Flashlight batteries and a half-dollar battery voltmeter constitute an effective and accurate cable-phasing outfit that is saving a lot of fussing around on the Milwaukee underground system. Six of the long, 4½-volt batteries are laid side by side in a flat box with brass spring clips at the ends of the batteries to hold them in place and connect them in series. One connection is to a ground lead and three other leads, marked respectively "A," "B" and "C," are tapped out for 9, 18 and 27 volts. The ground connection is made to the cable sheath and the three leads with phase markings are clipped onto the cable conductors. At the other end



Cable phasing made easy

of the cable run the voltmeter is used to identify the conductors by their potential indications. On the voltmeter scale are marked off sections "A," "B" and "C" corresponding to the designations of the leads from the battery box. It is not necessary for the operator to read the voltmeter, he simply observes the scale sections to which the pointer moves as he connects the instrument to the cable conductors in turn.

Quiet Operation the Result of Proper Motor Installations

By GEORGE H. HALL
Consulting Engineer, New York

Motors of today are far more quiet than their predecessors, but architects, builders and operators must co-operate if an acoustical engineer's services are not to be made necessary because of residual noises being accentuated by improper installation.

Sound-proof inclosures, silent belts, massive foundations, sound-isolating feet and noise-absorbing bases are available as means of noise control.

Unless one or more is adopted in critical cases all the quietness built into the motor by the manufacturer may be offset by amplification of what little noise the motor generates.

TWENTY or thirty years ago, when the use of machinery was limited almost entirely to strictly industrial purposes, the noise made by manufacturing machines and the motors by which they were driven, while far from pleasant, was accepted without question as an incidental evil that had to be endured and but little attempt was made toward its abatement. At least the annoyance was restricted to factory and shop workers and did not intrude upon the sensibilities of the general public. But when use of motor-driven machines, such as fans, elevators, pumps and appliances, became general in office buildings, schools, hospitals, apartment houses and even in private residences there arose a very insistent demand that the noise caused by such machinery should be eliminated or, at least, should be greatly reduced.

Machinery manufacturers solved their problem with comparative ease by the use of fiber pinions, accurate alignment of bearings and careful balancing of all rotating parts. For the motor builder, however, the problem was somewhat more complicated. Motors generally run at much higher speeds than the machines which they operate, so that any noises due to speed would consequently be more acute in the motor than in the machine. Further, the causes of motor noises are more numerous than those existing in most types of machines.

Noises arising from motors may be due to magnetic hum or to mechanical vibration. Facing these sources of noise, the motor builder must first decide how much noise is an objectionable noise. This question demanded serious consideration. No motor can be *absolutely* noiseless in its operation. Motors must be sufficiently quiet in their operation to be considered *practically* noiseless, while the expense involved in producing them must be kept within limits that do not render their use prohibitive.

Pulsating magnetism, which is inherent in all types of electrical machines, especially those operating on alternating current, sets up oscillations which usually come within the audible range. Vibrations from this cause may be greatly reduced by suitably designed slot construction, correct skewing of the slots, uniform air gap, proper flux density and similar carefully determined details of construction. They cannot be entirely eliminated.

Mechanical vibrations, even of minute magnitude, may still reach audible frequencies as perfect dynamic balance is not attainable. As with the magnetic vibrations, they can be reduced by proper design and careful workmanship so as to place the motor in a practically noiseless class.

Motors "designed and tested for quiet operation" are now commercially produced by nearly all of the motor manufacturers.

Surroundings may amplify residual noise

REDUCTION in motor noise from both of these sources has, however, reached a point where motors especially built for noise elimination are so nearly free from magnetic hum and mechanical vibration as to be satisfactory for nearly all practical purposes unless the vibrations are amplified. This amplification, taking place outside of the motor, is a factor of installation rather than of motor design.

Proper installation of a motor or a machine is one that prevents the transmission of any of the noise that may be inherent in the machine and also provides against its amplification. Transmitted noises may be of two natures, air-borne and vibratory.

With the inherent noise reduced to the point now attained in the commercial types of quiet-operation motors the first of these means of transmission, the air-borne, may be controlled with comparative ease by placing the motor, or the entire machine, in a suitable sound-proof inclosure. Air borne sounds do not travel very far as they are usually of low volume and intensity. Thus in the case of fans in a building, if the entire fan room is inclosed in sound-insulating walls and all of the openings properly sealed, there is but small chance of noise being transmitted through the air to the outside to any objectionable extent.

Fig. 1—Motors are tested for quietness in sound-proof booth

This G.E. test room is thoroughly insulated to exclude outside noises. The motor in this instance is mounted on a base resting on the concrete-slab roof of a noise-proof compartment to simulate conditions in an industrial or office building. What noise comes through the ceiling into the compartment is picked up by a microphone and read in decibels on the noise meter outside the compartment. Frame vibrations can also be read to one ten-thousandth of an inch by a direct-reading vibratometer.

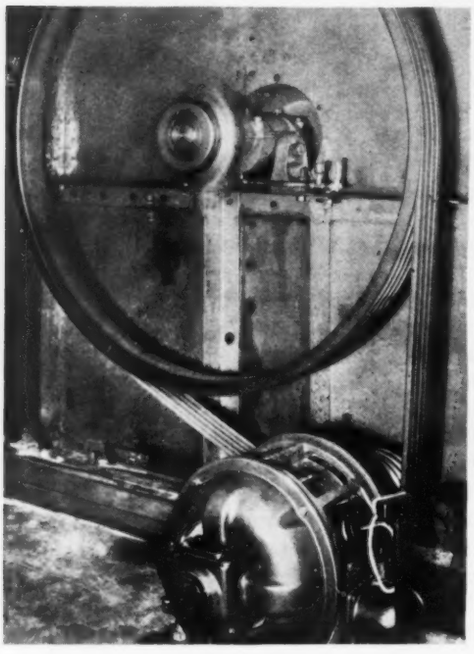


Fig. 2—In this fan installation the silent belt helps noise isolation

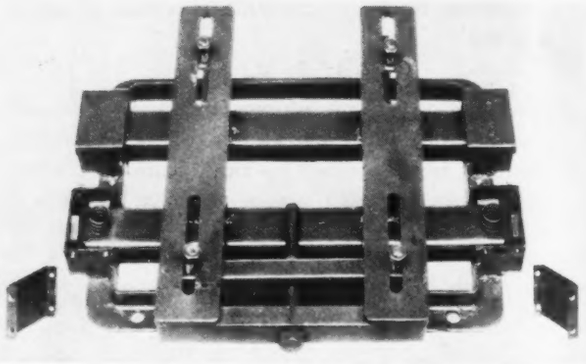
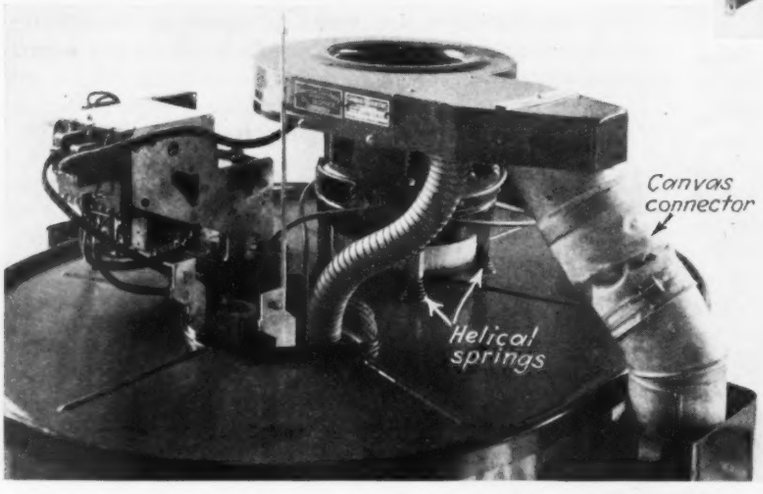


Fig 3—Base for wound-rotor motor isolates motor noises from mounting



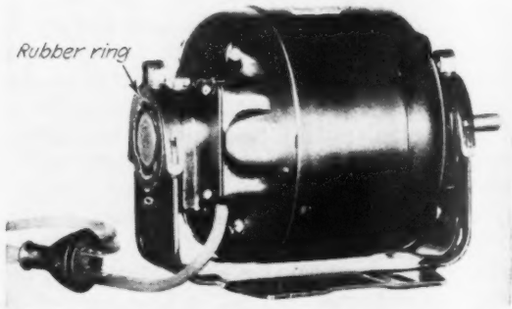


Fig. 4—Rubber cushion cradle incorporated into base of ¼-hp. split-phase motor

Fig. 5—Spring mounting of motor and canvas insert in air line prevent motor noises in G.E. domestic oil furnace

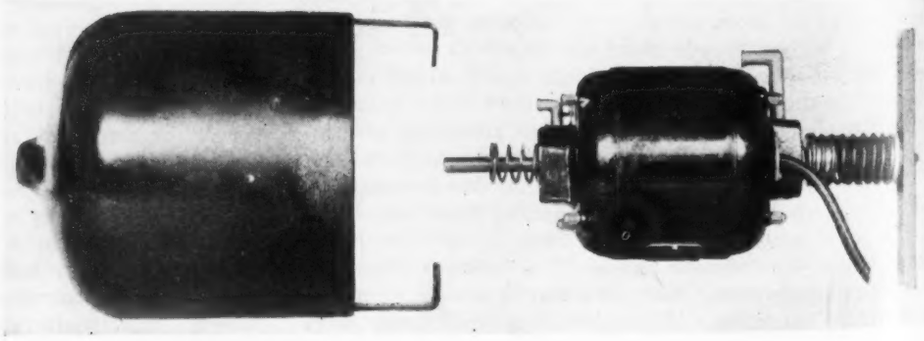


Fig. 6—Springs on shaft of air conditioner motor subdue its vibration and noise

Especial care must, however, be taken in the matter of closing all openings such as doors or windows. Even when closed these have far less sound-insulating effect than the well-designed wall in which they may be located, while, if open, a single door or window may completely offset all of the advantage gained by wall and ceiling insulation. When a room containing operating machinery is located in close proximity to rooms which are occupied for residential purposes, such as doctors' or dentists' offices, even the smallest openings such as cracks around the windows and doors, keyholes, clearance around pipes, etc., must be carefully sealed.

Belts and baffles subdue duct noises

A SOURCE of noise transmission to which the ventilating engineer must give especial attention is that of the transmission of audible vibrations through the air ducts. A most effective method of isolating motor vibration from the fan is found in the use of silent belt drive for connection between the fan and its motor. This type of drive (Fig. 2), consisting of a number of V-shaped belts running in grooved sheaves, has almost entirely replaced the former practice of employing flat belts. In addition to its admirable feature as a sound isolator the silent belt drive operates on much shorter center distances than the flat belt drive, thus effecting a saving in floor space, and it also obviates the flapping of the belt, which in itself often proved a source of considerable annoyance as its sound was readily transmitted through the ducts to remote parts of the building.

A further precaution against the transmission of audible vibration from either fan or motor consists in the introduction of a flexible section of heavy canvas into the air duct between the fan outlet and the commencement of the duct system.

It is with the vibratory noises that the greatest difficulty of noise isolation is found. The vibratory noises are those transmitted through the feet of the motor to the foundations upon which they rest and thence to the floors and walls of the motor room and of adjoining rooms.

The natural method to suggest itself for the elimination of such noise transmission is the use of sound-insulating material interposed between the feet of the motor and the floor or foundation upon which the motor is placed. To a greater or less extent this will prove satisfactory, but exhaustive research has shown that this can be uniformly successful only when all of the factors entering into the production of vibration are taken into the calculation for the particular motor under consideration. These factors include weight, speed range, center of gravity, moment of inertia, frequency of vibrations, etc. Such determinations do not come within the province of the architect or engineer, but rather in that of the motor manufacturer. This has resulted in the development by the motor builders of sound-isolating bases, each base especially designed for the size and speed of the motor with which it is to be used. Such bases incorporate floating members suspended on specially developed sound-isolating material which is inclosed and mounted so as to provide long life and freedom from damage.

Sound-isolating bases are available

Through laboratory research it has been found that a motor which is mounted on a flexible base may attain six different kinds of harmonic or natural periods of vibration. In the design of the sound-isolating bases provision is made to prevent any of the six natural periods of vibration from appearing within the permissible speed range of the motor as well as to provide isolation for all impressed or audible frequency vibrations. While such bases provide a degree of flexibility of mounting, they at the same time employ a stiffness of sound-insulating material to maintain the motor alignment for any reasonable belt tension.

In standard quiet-operation motors, when used in conjunction with their sound-isolating bases, the amplitude of vibration has been reduced to a point where it will not cause objectionable noise. From this point the prevention of annoyance from motor or machine noise comes within the scope of the architect, the builder or acoustic engineer. He is facing the problem that while the noises of the motor have been reduced to a very low degree his responsibility is to prevent their transmission and amplification.

Resonant walls will amplify the sound

STEEL, concrete and even wood are better transmitters of sound than air. If therefore the vibrations of pieces of machinery are not properly isolated from the steel beams or concrete foundations upon which they are mounted the vibrations transmitted by them will sooner or later reach the walls and ceiling of the room in which they are operated or they may be transmitted to other rooms. Under extremely poor conditions of isolation they may be carried through a large portion of the building. The noise thus transmitted may then be amplified by a large surface and a noise produced that will be more intense than it was at the original source. If in addition some wall or ceiling has a natural frequency corresponding to that of the transmitted vibration a resonant condition is set up and the noise may be increased several-fold. As the noise intensity increases in proportion to the square of the amplitude it is readily seen that vibrations which at their point of origin may not have been objectionable may be thus amplified to the extent of becoming very annoying.

In the foregoing, consideration has been given to the isolation of sound in connection with motors employed for the operation of what may be termed building equipment, such as fans, elevators, pumps, etc. There is another field in which the use of motors is becoming more and more extended and in which the demand for quiet operating motors is most imperative. This is for use in connection with household appliances, for constant or intermittent use, such as refrigerators, oil burning furnaces, pumps, etc. This class of apparatus, used in small and medium-sized residences, may cause great annoyance if the motor noises are not properly guarded against. This was very promptly brought to public attention in connection with some of the early types of electric refrigerators. Most of us can recall cases where the operation of a refrigerator which was not properly sound-isolated could be heard throughout the entire house and its intermittent starting and stopping caused actual discomfort to the residents.

The particular demand for quiet operation of apparatus of this class is emphasized by the fact that many of the appliances operate during the night as well as by daytime and noise during the otherwise silent hours is particularly objectionable.

With most of these devices the power demand is comparatively small, so that motors of fractional-horse-

power capacities are more generally used. This small power demand has the advantage of permitting the installation of the appliance on the lighting line, thus obviating the necessity of installing a separate power circuit. This advantage, however, means the use of single-phase motors, which in their standard construction are comparatively noisy.

ELECTRICAL hum of the single-phase motor is, to all practical purposes, eliminated by the use of the capacitor type of motor, which, when properly designed, does not emit much more noise than an ordinary watch. In many cases standard single-phase motors may be employed if the construction of the apparatus which they operate permits of proper sound isolation. Single-phase motors are subject to a torsional vibration of the motor about the shaft, and to prevent the transmission or amplification of this vibration sound-isolating mountings are employed.

A most efficient type of sound isolation consists of the use of such a base as is shown in Fig. 5. In this mounting a rubber ring is placed around each bearing housing, these rings being carried by the vertical arms of the base. This provides sufficient torsional elasticity for the isolation of the torque pulsations and possesses sufficient radial stiffness to allow for belt operation.

Another successful method of sound isolation consists of placing helical springs beneath the feet upon which the motor rests. This is illustrated in Fig. 5, which shows the motor compressor used in a domestic oil-burning furnace. The transmission of sound through the air duct is inhibited by the use of a flexible canvas section introduced into the air piping in a manner similar to that employed for isolating the noise of large fans and blowers from the air ducts.

Cable Saw for Shop Makes Hard Work Easy

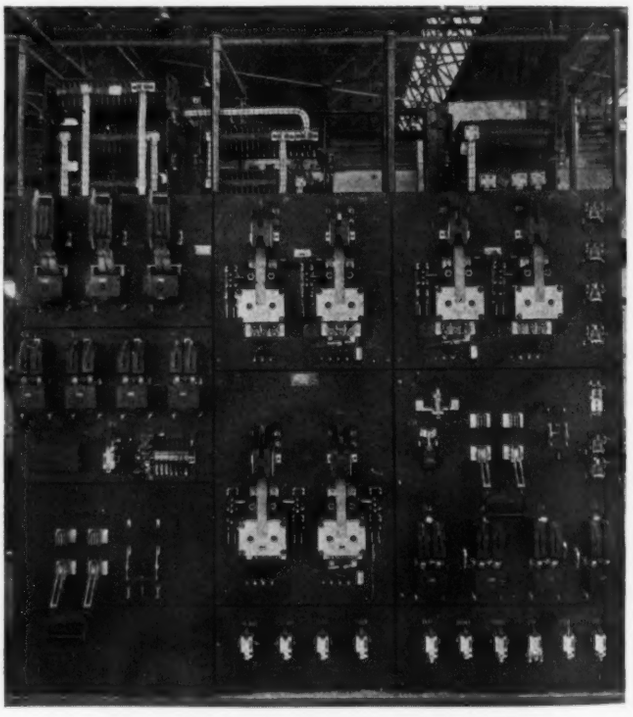
Any man who has ever put in a day's work cutting junk cable into handling lengths by hand methods will appreciate the relief of tired muscles brought about by such a power saw as is here illustrated and which is used in the cable salvage shop of the Commonwealth Edison Company, Chicago. The saw is mounted on a plate which slides in guides on a flat steel table. Transverse to the saw motion is a groove in the table top through which the junked cable is fed.

· · · INDUSTRY

Variable-Speed Motor Aids Tube Drawing

By GEORGE WHITTAKER
Resident Electrical Engineer
Chase Brass & Copper Company, Cleveland

Among interesting electrical installations in the Cleveland mill of the Chase Brass & Copper Company is the control for an electrical push bench. This machine is driven by a 300-hp., 230-volt, d.c., variable-speed motor and is used in the first cold operation in making a tube. It differs from the operations which follow it in that it pushes the tube through a die, instead of drawing it through.



Two right-hand panels contain controls for 300-hp. push-bench motor

The control of this machine has been so arranged that, through a combination of a load relay and track switches, when the operator throws the master switch to the full "on" position, the motor will start, accelerate, push the ram into the tube, and just before the tube enters the die will slow down to a creeping speed. The moment the tube enters the die the motor accelerates again to the speed determined by the rheostat setting.

Finally, as the tube leaves the die, the motor stops, reverses and at top speed returns to its original position—that is, with the rheostat shunted out of the circuit—and stops, ready to repeat the operation.

The operator can stop and reverse the motor at any

PRACTICES IN BRIEF . . .

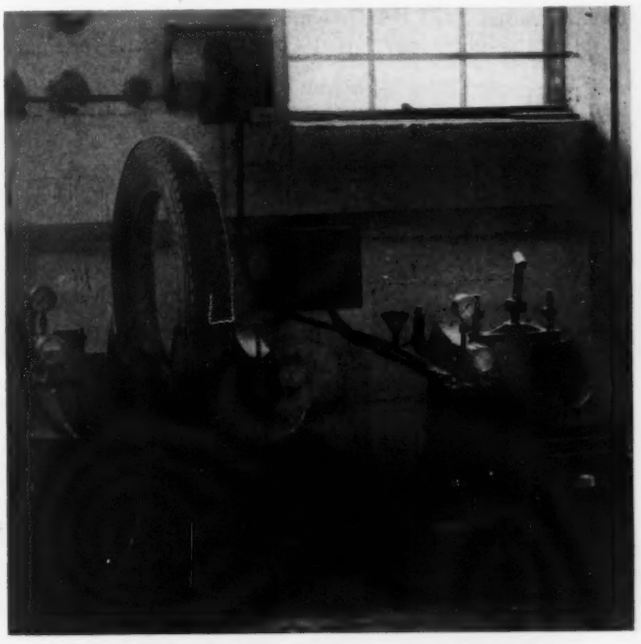
point in the foregoing cycle with the master switch. Shunted armature and dynamic braking are both used to bring the machine to a quick stop, eliminating non-productive "coasting" time.

Electric Vulcanizing Increases Shop Output

With a battery of four electric vulcanizers the tire repair establishment of Thos. E. Hogan, Inc., Boston, Mass., has found it possible to increase production from 10 to 15 per cent over the rate which it would obtain with gas fuel, besides working in a shop atmosphere free from vitiation and large dissipation of waste heat. The saving in time results mainly from eliminating the need of watching fuel-consuming heating elements to avoid damage to stock from overheating and unsatisfactory processing through under-heating. Electrically heated molds have been used by this concern for 7½ years with notable satisfaction both as to character of output and working conditions.

Vulcanizing units are of the type using two 220-volt, 2,500-watt electric heating elements which produce steam from water carried in jackets furnishing heat to the outsides of the tires when set in place for curing after patching. Heavy truck tires are also heated on the inside by applying steam pressure to bags designed to conform to their shape, aluminum plates being used between the bag and the inside of the tire to insure first-class fit. Steam is supplied from a 5-kw. electric boiler.

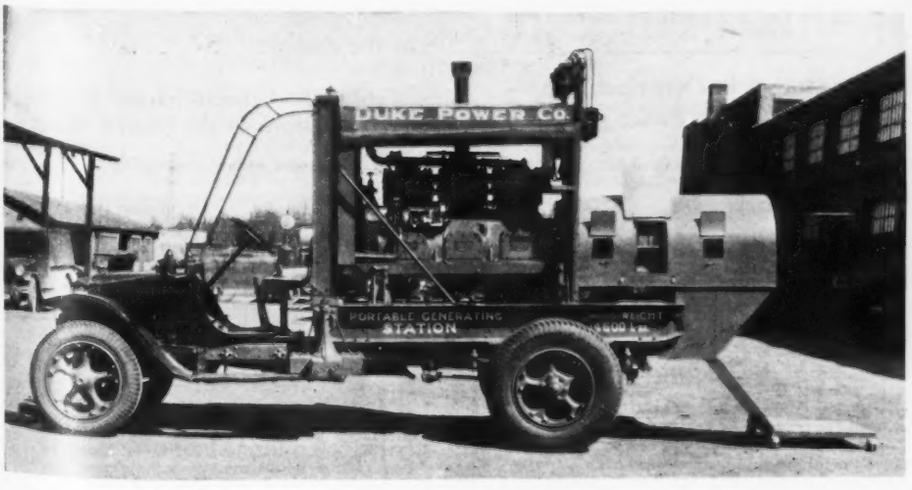
Automatic control of the electrical energy supply is obtained from a thermostatic switch mechanism which allows intermittent service to be furnished both the electric boiler and the jackets of the mold.



An all-electric vulcanizing shop

Portable Generating Station Meets Rural Emergencies

For breakdown service on rural and other lines the Duke Power Company has devised a portable generating station. Essentially it is a 75-kw. Buda engine-generator set mounted on an auto truck. This 2,300-volt station may be connected quickly to a line of supply service and has proved to be most useful in the event of transformer failures on rural lines.



Utility Revenue Under Previous Year's

REVENUE of electric light and power companies continues to fall slightly short of the amounts received a year ago, although the energy sales have been greater. Returns received by ELECTRICAL WORLD for December show a decrease of 1.4 per cent compared with the same month in 1932, making the total $169,540,000 against $171,880,000 in the preceding year.

During the early part of 1933 revenue was running about 9 per cent less than in 1932. The disparity began to shrink perceptibly in May and in June had fallen to less than 1 per cent. July brought the first break in the long series of minus signs that had characterized the monthly comparisons. The improvement was maintained through August and September, though the excess over 1932 was in no month greater than 2 per cent. But during the last three months relative losses again appeared, although seasonal influences made the actual receipts increase.

For the year as a whole the net effect was to make the grand total, $1,906,110,000 (subject to minor adjustments), 3.5 per cent less than in 1932, so bringing the third consecutive year of declining revenue. It should, however, be noted that in comparison with many other lines of industry the recession has been moderate; the drop from 1930, the peak year, was only 11 per cent.

In keeping with the lower revenues the expenses for operation and maintenance were less than in 1932 during the first two-thirds of the year, but have been higher since September. The excess amounted to 2.4 per cent in December, when the total was $71,500,000 compared with the revised figure of $70,300,000 a year ago.

With rates for domestic use still declining while consumption is doing little better than to match the preceding year's amounts, with retail commercial sales similarly showing only a small increase in kilowatt-hours, and with the expanded consumption restricted in the main to the wholesale field, where the price trend is also downward, it is no paradox that larger output should bring somewhat less revenue. As to operating expenses, increased fuel consumption alone would account for a good share of the change.

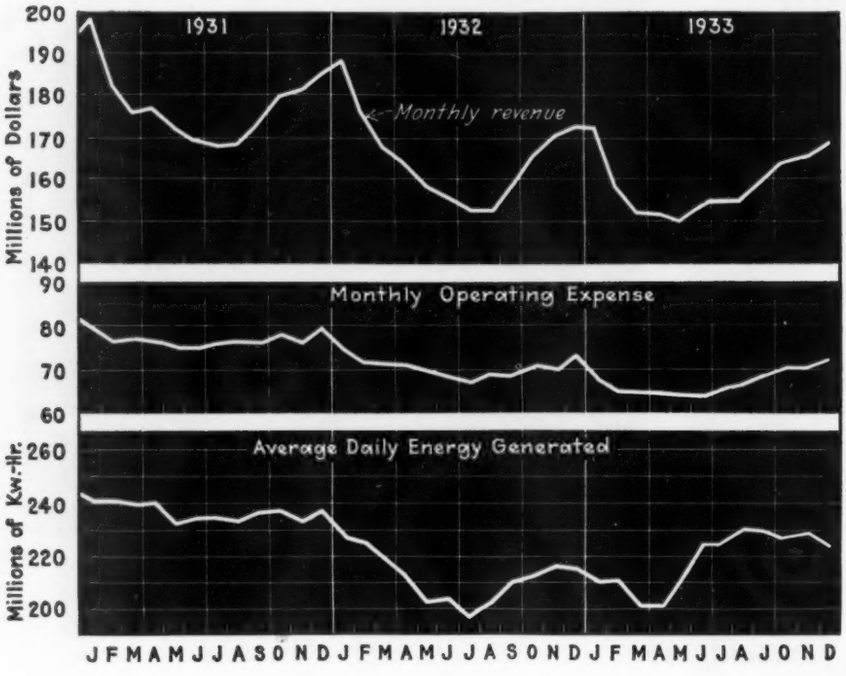


Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1933	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
September	6,908,017	+ 9.6	2,713,810	+21.6	4,194,207	+ 3.2	1,994,000	
October	7,024,674	+ 6.5	2,426,639	— 3.0	4,598,035	+12.3	2,068,000	+ 1.2
November	6,786,505	+ 4.3	2,328,938	—12.8	4,457,567	+16.3	1,914,000	+ 1.3
December	6,960,050	+ 4.8	2,539,360	— 1.4	4,428,690	+ 8.8	1,830,000	— 7.3

Table II—Regional Revenue, Energy Output in December, 1933

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	169,540	— 1.4	6,968,050	+ 4.8	2,539,360	— 1.4	4,428,690	+ 8.8
New England	18,930	+ 0.1	508,574	+11.2	220,831	—14.0	287,743	+47.3
Middle Atlantic	45,920	— 1.4	1,876,623	+ 2.7	595,110	+ 8.6	1,281,513	+ 0.2
East North Central	38,750	— 3.8	1,708,858	+ 9.1	140,242	— 9.3	1,568,616	+11.1
West North Central	14,210	— 1.5	440,722	— 0.3	83,706	—16.3	357,016	+ 4.3
South Atlantic	18,530	+ 1.6	791,525	+ 0.7	367,756	—23.2	423,769	+37.3
East South Central	5,360	— 4.0	239,827	+ 8.9	180,962	+ 5.1	58,865	+22.2
West South Central	8,980	— 3.8	318,971	— 2.0	7,279	+ 8.3	311,692	— 2.3
Mountain	4,010	+ 2.0	225,627	+19.2	177,328	—22.7	48,299	— 7.0
Pacific	14,850	+ 0.5	857,323	+ 3.6	766,146	+ 6.4	91,177	—22.3

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-sta tion

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenance Expense†	
	1933 Thousands	Per Cent Inc.	1933 Thousands	Per Cent Inc.
Sept.	$160.080	+ 1.5	$68,060	+ 4.5
Oct.	163,940	— 0.9	70,330	+ 1.5
Nov.	165,890	— 1.7	70,580	+ 2.0
Dec.	169,540	— 1.4	71,500	+ 2.4

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Does not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

Classified by regions, revenue increased over the preceding December in the Rocky Mountain and South Atlantic division. The former has for several months been far ahead of 1932 in energy production, presumably because of increased activity in mining. Gains in revenue were much smaller, being about 1 per cent in November and 2 per cent in December. New England and the Pacific states were at last year's level, other regions were lower. In the East Central States, North and South, energy production was 9 per cent larger, while revenue was 4 per cent smaller than a year ago.

LETTERS TO THE EDITOR

Some Shortcomings of Electrical Contracting

To the Editor of the ELECTRICAL WORLD:

It certainly is refreshing to read your editorial in the February 3 issue of ELECTRICAL WORLD entitled "The Contractor as an Industry Problem."

There has been a great deal of conversation and letter writing during the past few months concerning our problems and sometimes it appeared that many prominent people in the electrical industry were of the opinion that the electrical contractor was not necessary and that he would gradually become an extinct species. We, of course, have always felt that the contractor was an important and necessary part of the electrical industry and that some day it would be necessary for the other interests to do something really worth while to help put him where he belongs.

There is no doubt that the people in the electrical contracting industry, as well as other branches of the construction industry, are themselves largely responsible for their present plight, but at the same time they have always been up against conditions far more severe than those encountered by the manufacturers, jobbers, central stations and the other people comprising the electrical industry.

The one thing above everything else that makes our problem so difficult is the fact that any one, regardless of his experience, financial means or business ability, can enter the electrical contracting industry any time he sees fit, and until this condition is corrected our job will continue to be just as difficult as it is now.

If a man wants to become a manufacturer of motors, transformers, safety switches or other electrical devices it is necessary for him to have, or secure, considerable capital and obtain an organization for the operation of his company. The same applies to the jobbing business and other branches of the industry. These people may think they have pretty tough competition, but they will have to agree that if it were possible for a man to become a manufacturer of motors overnight just simply by announcing himself a motor manufacturer their problem would be a hundredfold more difficult.

Another big thing that must be done is to convince the general public that there are different classes of electrical contractors, the same as everything else, and get it away from the idea that just because an architect writes a set of specifications and inspects the work as it is being done this makes all electrical contractors equal, and that the job may be awarded to any one who calls himself an electrical contractor and still obtain a first class job.

At various times the electrical contractors have attempted to have legislation passed in the various states requiring the licensing of contractors, and I believe a few such laws have been passed. This, however, does not prove entirely satisfactory, due to politics creeping into the situation.

I believe you could be very helpful in publishing more editorials emphasizing these problems and others which we have to contend with and urging the manufacturers, jobbers, utilities, etc., to make greater efforts to find out just what the contractor really is up against in his business, do what they can to help put the good contractors on a par with other good companies in the electrical industry and to make it difficult for the "curbstoners," as you have called them, to continue chiseling in on the good contractor and putting him out of business entirely, as is being done at the present time.

W. V. Pangborne & Co., Inc.
Philadelphia, Pa.

N. P. HOISINGTON,
Vice-President.

Manufacturers Should Reduce Impedance of Distribution Units

To the Editor of the ELECTRICAL WORLD:

Your editorial in a recent issue of the ELECTRICAL WORLD with reference to advocating lower impedance for distribution transformers is timely. We have recently been making an analysis of voltage flickers produced on fairly heavy distribution circuits by the operation of unit air-conditioning equipment involving motors as low as 1½ hp. driving the compressor unit.

Because of the variation in power input between the compression stroke and the suction stroke, a variation in input running amperes from a peak of 15.9 to 20.8 was observed regularly every five cycles. This variation in amperes was accompanied by a variation in power factor, both of which operated accumulatively to produce a flicker which was unbearable. If an analysis is made of the various elements entering into the distribution circuit, it is found that the transformer impedance is a very material part of the total.

We have had cases on our rural lines where small transformers installed for individual customers have had such high impedance that the voltage drop caused by the start of a refrigerator motor or fractional-horsepower pump motor was sufficient to cause complaint. I am thoroughly in accord with the suggestion that the manufacturers give more attention to this problem.

I believe it is up to the operating companies' engineers to impress upon the manufacturers the necessity of considering factors other than thermal capacity, mechanical strength and dielectric strength between primary and secondary windings. Proper protection against these hazards can be obtained in other ways than by building large inherent reactance in the transformer.

WILLIAM SHULER,
Manager Electrical Division.
Dayton Power & Light Company.

NEWS OF THE WEEK

E. J. Doyle Resigns from Commonwealth Edison

Another man close to Samuel Insull in the days of his power has been removed from the tangled public utility situation in Chicago. Edward J. Doyle, who began as Insull's office boy and rose to be the chief executive of his largest company, has resigned as president of Commonwealth Edison. G. A. Ranney, vice-chairman, in announcing the resignation said that Mr. Doyle "believing that his indictment last year in the federal court as a director of a certain corporation, in no way affiliated with the Commonwealth Edison Company, may be considered by some stockholders of the Edison company as detrimental to their interests, and feeling that it was appropriate for him to act prior to the annual meeting of the Edison company, resigned as president, after thirty-eight years. He will perform, without title, his former duties, the position of president remaining unfilled."

Blizzards Hit the Northeast

Within less than a week two severe storms have swept toward the Atlantic, concentrating their fury on Connecticut and Long Island. Utilities fare better than railroads.

ELECTRIC utilities of New England and Long Island met the winter's worst challenge last week with every modern resource, when a combination of snow, ice and wind interrupted service on the New Haven and Long Island railroads and tripped from service a number of transmission circuits in Connecticut, Massachusetts and Rhode Island to upset local power, light and telephone service in many communities for hours. Twelve to 28 inches of snow in the first storm and nearly as much in the second, followed by ice and wind, did much damage and impeded restoration of service. Maine, New Hampshire, Vermont and the Cape Cod district suffered little in comparison with southern New England, where the snow was wet.

On the electrified division of the New Haven railroad from New Haven to New York catenary failures, due to arcing between pantograph and wire as a result of snow, and transformer grounds on locomotives, caused by finely divided snow entering through the ventilating system, were prevalent. There were also many insulator flashovers, according to Sidney Withington, railroad electrical engineer, which were not serious. At Mount Vernon, N. Y., a phase short occurred when the wind blew two phase conductors together and grounded the distribution system at that point and involved the signal system when the conductors dropped. Mr. Withington said that power supply gave no real trouble, although there were separations between the Cos Cob railroad plant and the New York Edison supply at New York and the Connecticut Light & Power tie at Devon.

Connecticut worst hit

On the Connecticut Light & Power system, according to Irvin W. Day, vice-president, the storm of the 20th was the most serious in company experience because drifts kept men from points of difficulty; one crew took thirteen hours to reach a break 5 miles from the Norwalk service building. Transmission lines held up well, except for two breaks between Devon and Norwalk which interrupted the Norwalk area for several hours. The system load was 60 per cent of normal during the day and 80 per cent of normal at the evening peak. In general, supply to points outside the Norwalk area was substantially normal at all times.

C. W. Mayott, manager Connecticut Valley Power Exchange, Hartford, states that two spans of the 66-kv. Hartford-Agawan line tying Springfield-Hartford districts together burned out, but service was maintained from the State Street plant of the United Electric Light Company in Springfield. Very little low-tension trouble occurred and frequency was maintained closely in all sections. Electric railway service was hard hit in southern New England for two or three days, but telephone service was good.

The New England Power Association system sustained two 66-kv. line failures between Millbury, Mass., and Woonsocket, R. I., but little inconvenience arose, thanks to the 110-kv. lines, which were intact. Boston Edison suffered interruptions on 4,600-volt distribution lines in Waltham, Dorchester, Chelsea and East Boston due to falling trees, and the Central Maine Power Company had similar trouble in Waterville and Gardiner, with a 250-kva. generator failure in Waterville. No figures on losses to New England utilities have been compiled as yet, but these will likely exceed $500,000.

Long Island isolated

On Long Island, in spite of the fact that the Long Island Railroad (chiefly electric) had its service disrupted for nearly 24 hours on the first occasion and for nearly half as long on the second, J. W. Carpenter, chief engineer of the Long Island Lighting Company, reported the damage as "not serious," with only a few lines down. Their worst break was caused by twenty poles being snapped off on the Rockaway peninsula. Two substation outages were sustained in the early morning of the 21st, with attendant interruptions to Great Neck, Garden City and other towns of several hours. Late reports from the Carolinas indicate serious storm damage. Some communities were isolated electrically for 24 hours.

"New Era" Call Loans by Holding Companies

How public utility holding companies were loaning call money during the heyday of the "new era" was told before the Senate committee on banking and currency last Friday. They were investigating the activities of non-banking corporations in financing trading on the New York Stock Exchange in 1929. Testimony was heard from Cities Service Company, Electric Bond & Share Corporation and American & Foreign Power Company. Cities Service loaned on call an aggregate of $285,325,092. The largest amount outstanding at any one time was $41,900,000. Bond & Share loaned in all $867,295,000, but never had more than $87,900,000 out at any one time. Many of the loans were for one day only and they earned from 5 to 15 per cent in interest, according to those who testified.

When Ferdinand Pecora, counsel for the committee, asked, "Was the call loan business a wholesome thing?" C. E. Groesbeck, president of Bond & Share, replied: "We had lots of advice from Americans and from foreigners and they said we were in a new era, that they would go on forever. But in the light of subsequent events, this did not hold."

Lehman Legislation Warmly Fought

Bankers, insurance companies, utilities and investors oppose Governor—Commission plans for regulation.

GOVERNOR LEHMAN'S twelve-point plan for utility legislation in New York swept well into the hearings stage last week with discussions in Albany continued this week. Chief among the Governor's objections are: (1) provision that municipalities may build distribution systems; (2) provision that during emergency the state commission can order rate reductions to a limiting return on investment of 5 per cent; (3) provision that municipal systems be placed under the jurisdiction

Chairman Carlisle

of the state commission in all respects but the power to grant permission to build or not build competing systems.

Representatives of insurance companies, banks, utilities, consumers, municipalities and other interests commented at length on the proposed measures. G. V. McLaughlin, former Democratic bank superintendent, opposed the bills on behalf of the banking interests. He stated banks owned upward of $200,000,000 of utility securities and in a fiduciary capacity owned $500,000,000 of these securities. The value of these securities as well as the bonds of municipalities would be lessened by municipalities going into the utility business. He also objected strenuously to price fixing by statute.

Carlisle presents utility case

Briefs in opposition to the bills were filed by the utilities and Floyd L. Carlisle presented their case. He stated that if utilities were tax exempt they would reduce their rates at once and pointed out that no social gain would occur by installing competing utilities. He said the proposed municipal competition would ruin the private utility business and that it was only just to provide for the purchase of private utilities at a fair price. He pointed out that the New York utilities alone paid taxes of $50,000,000 a year and that a large part of this would be lost if tax-exempt municipal bonds were issued. If it is desired to have a state-wide system such as Ontario Hydro, Mr. Carlisle said that if the tax burden were removed the private utilities would meet Ontario rates, but if the state desired to build the system it should purchase existing facilities. He also pointed out the faults of the 5 per cent return and its evil effect on utility credit, outstanding securities and the cost of money.

Bainbridge Colby, representing William Randolph Hearst, said the opposition to the bills was foolish and short-sighted. He said the recent investigation showed that "the utility business in this country is the most disgraceful of any business." In his opinion regulation was necessary. Others who spoke in opposition to the bills were George McCaffrey of the Merchants' Association, M. K. Hart of the New York State Economic Council, Thomas F. Woodlock of the New York Chamber of Commerce and Dr. F. J. Douglass of the New York State Federation of Utility Investors. Dr. James C. Bonbright submitted a memorandum in favor of the bills.

Governor Lehman stated at the time of the hearings: "There is certainly concerted and co-ordinated propaganda on an unprecedented scale against any public utility bills. It is interesting that this propaganda is being sponsored very fully and very openly by the great utility companies."

Floyd L. Carlisle stated, with particular reference to the municipal ownership bill:

"It would be completely betraying the people who have intrusted me with a position of responsibility in these companies, that represent an investment of slightly under two billion dollars, if I did not say to you, gentlemen, in my judgment competition by municipalities free from taxation would mean our complete and utter eventual ruin.

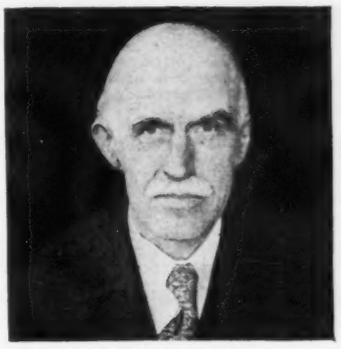
"There is absolutely no municipality doing business in the state of New York that would sell power as cheaply as the up-state companies would sell if they were freed from taxation."

Maltbie backs the Governor

Chairman Maltbie of the Public Service Commission, replying to the assertion that passage of the program would strike at the "widow and orphan" living on investments in utilities, said:

"The time to protect the widows and orphans is not after they purchased the securities, but when the securities are sold to them. Personally I want to protect the investor."

Mr. Maltbie insisted that the bills limiting charges by one affiliate to another and to require competitive bidding on construction projects were obviously proper and should be supported by the investors in their own interest. He struck at cost-plus construction by favored contractors and said he could see no reasonable objection to the measure to make sure that transmission companies came under the jurisdiction of the Public Service Commission.



Chairman Maltbie

Cosgrove asks laws

"It is essential, it is vital," said Delos Cosgrove of the New York Power Authority in backing the Dunnigan bill, "that this legislation be passed in order to put the Power Authority in a position to make contracts from which the people of the state will receive their full benefits from the development of this mighty river.

"I plead with the members of this Legislature to pass this bill. By doing so, fair contracts for the sale of this power ought to be made; without it, the people can never realize the full benefits from the St. Lawrence to which they are entitled."

Utility Code Still in NRA Conference

The code for light and power companies remains in the code grinding mill, according to reports from Washington. Essentially the problem is to arrive at fair specifications for hours of work. The nature of utility service and the different conditions found in large and small utilities call for some differentiation and classification. NRA authorities would like to have a base 40-hour week, but it is claimed that this puts a burden on small utilities and on those that serve small communities, where a base 48-hour week is desired. In addition the conditions of emergency service in the utility business make it difficult to limit hours per day or per week. Also, apparently the fairness of code provisions where direct competition is had is granted by NRA. Agreement on most points is expected very shortly and Presidential approval should follow.

Coming Meetings

Oklahoma Utilities Association—Tulsa, Okla., March 6-7. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

American Society for Testing Materials—Washington, D. C., March 7. G. L. Warwick, 1315 Spruce Street, Philadelphia, Pa.

Association of Iron & Steel Electrical Engineers—Youngstown, Ohio, April 12. J. L. Kelly, Empire Building, Pittsburgh.

Missouri Association of Public Utilities—Excelsior Springs, Mo., April 19-20. N. R. Beagle, 101 W. High St., Jefferson City, Mo.

Electrochemical Society — Asheville, N. C., April 26-28. Colin G. Fink, Columbia University, New York.

American Institute of Electrical Engineers—Northeastern District meeting, Worcester, Mass., May 16-18. Summer Convention, Hot Springs, Va., June 25-29. H. H. Henline, 33 W. 39th St., New York.

Edison Electric Institute—Atlantic City, N. J., June 4-7. B. F. Weadock, 420 Lexington Ave., New York.

J. B. Balch to Head Michigan Commission

James Bird Balch, former Mayor of Kalamazoo, has been appointed chairman of the Michigan Public Utilities Commission to succeed Kit F. Clardy, who was ousted, along with Harry C. McClure and Edward I. Fitzgerald, recently (ELECTRICAL WORLD, February 24, page 307). Clardy has announced that he would institute *quo warranto* proceedings challenging the appointee's right to hold office because the Governor failed to heed a restraining order that would have put off the removal hearing ten days. Balch, who took office February 26, is a business man, interested in paper manufacture, farm enterprises and various other concerns. He is a prominent Democrat.

Governor Comstock has announced that Robert H. Dunn and Harold J. Maples, who resigned before the investigation, will remain "probably a few weeks"; he had previously asked them to remain at least a month to train new appointees. He said a bill providing for a three-man commission will not be introduced at the special session of the Legislature.

Alabama Court Upholds Municipal Plant Law

In an advisory opinion rendered at the request of Governor Miller, who wished to clarify the position of a dozen municipalities which have applied for loans from the federal government, the Alabama Supreme Court upheld the constitutionality of the Carmichael act of the 1933 Legislature providing a means by which cities and counties may construct and operate their own electric power plants. The opinion of the court upheld the contentions of Attorney-General Thomas E. Knight, Jr., who already had ruled that the act was validly passed and in no way conflicted with the constitution of Alabama. P.W.A. loans to numerous Alabama cities may be obtainable by the municipalities now.

Three members of the court did not sign the opinion, though they concurred with the lone exception that they did not believe cities which had reached their constitutional debt limits could execute the special loan contract provided in section 4 of the act, "which might in the future create obligations and additional indebtedness." The opinion of the court held, however, that the act was validly passed by the necessary majorities of both houses of the Legislature, despite the fact that its subject matter was not included in the governor's call for a special session. Regarding the financial obligation made by a city in constructing a plant the majority opinion said: "It is our opinion that any lender to such municipalities upon acquiring any such contract does so with notice it may merely serve as an aid to a direction of the funds specifically pledged into the proper channel, and no obligations could arise thereunder which would constitute any charge against the general credit of such municipalities. . . "

Among the Alabama cities whose public works loans proposals are affected by this ruling are Bessemer, Russellville, Tuscumbia, Decatur, Oneonta, Enterprise, Andalusia, Guntersville, Tarrant City and others.

Municipal Excess Profits Discussed in Wisconsin

Maintaining that excess earnings of municipal utilities should go toward rate reductions rather than municipal tax reductions, Theodore Kronshage, chairman of the Wisconsin Public Service Commission, issued a warning to members of the Wisconsin Municipal Utilities Association at a recent conference in Madison that the use of such earnings to reduce taxes may discriminate against small consumers in favor of large landowners or industries. Mr. Kronshage cited as an example a company at Manitowoc which buys nothing from the local municipal utility, but purchases its power from the Wisconsin Public Service Corporation, yet would benefit in reduced taxes if earnings of the Manitowoc municipal utility were diverted to reduce general city taxes.

The conference, at which Mr. Kronshage and Commissioner Fred S. Hunt presided, concerned necessary changes in laws regarding municipal utilities and problems of procedure to be settled by the commission. The association's legislative committee and the commission will meet this month to formulate a program to be presented before the 1935 session of the Wisconsin Legislature. For the consideration of the commission, municipal utility officials submitted clarification of rate computations and service charges, recognition of uniform rates of depreciation and the granting of discounts to customers in arrears.

New Utility Regulation Policy in Missouri

Approval of the five-year extension of the 5 per cent refunding and extension mortgage bonds of the Laclede Gas Light Company (ELECTRICAL WORLD, February 24, page 312) recently given by the Missouri Public Service Commission marks a new policy in public utility regulation, that of definite protection for investors. The commission ruled it would supervise the surplus company earnings to see that the funds were used for reduction of company indebtedness before common stock dividends would be allowed. Likewise, to protect the investors further the company must report each six months the amount of net income in its hands and the manner in which it had been invested. To insure a sinking fund the commission set a limit of an additional $3,000,000 to be added to the sinking fund before any dividends be paid.

"Although this commission has no direct jurisdiction over the distribution of the net earnings of utility corporations, it can and does expect and insists that the utilities so conduct their affairs, even to the extent of the curtailment of dividends, that a continuity of operation may be had, unjeopardized and unhampered by avoidable financial difficulties. A desire for dividends should be subordinated to the general welfare of a corporation and the public served," said the order.

Wisconsin Body Rules on Non-Affiliate Service

In a recent ruling the Wisconsin Public Service Commission has maintained its right to require a public utility rendering general service at wholesale to sell service to another utility not affiliated with it. The ruling was written by Alvin C. Reis, general counsel for the commission, in proceedings concerning the village of Pardeeville, which is attempting to acquire the Pardeeville Electric Company as a municipal distribution plant. "To hold otherwise would be to enable public utilities to avoid strict regulation through the device of a wholesale contract," Mr. Reis said.

The Pardeeville company, privately owned, purchases its power at wholesale from the Wisconsin Power & Light

Company. Because the village is now proceeding to acquire it, E. J. Morehouse, chief of the rates and research division of the Public Service Commission, has refused to approve a new ten-year contract that calls for higher rates and would be binding upon the village as a future owner. Attorney Reis contended that the obligations under such a contract do not fall upon the assignee unless, by a new contract, the latter assumes the obligation.

Mr. Reis expressed the belief that the Public Service Commission has jurisdiction over rates for wholesale service regardless of the absence of affiliation between utilities.

Johnson Bill Meets Presidential Favor

President Roosevelt has approved in substance the recent bill introduced by Senator Johnson to take public utility rate cases out of the federal courts (ELECTRICAL WORLD, February 17, page 270). He told the correspondents at a press conference that he regards as intolerable the situation exemplified by the New York telephone case in which the state commission's order reducing intrastate rates was held up for seven years in the federal courts and finally voided. The President is familiar with the long history of the bill and is very much in favor of removing the orders of state public service commissions from the jurisdiction of the federal courts as a result of his experience with such litigation when Governor of New York. He hopes the bill will be enacted, but will not make it the subject of a message.

Knoxville Utility Fails to Set Price

Tennessee Public Service Company has told the Knoxville City Council that it will be unable to meet a time limit imposed for the submission of a price on its electrical distribution system in Knoxville. Councilman W. A. Cockrum late last week annuonced that he would ask the Council to authorize construction of a central substation as the first step in erecting the city's plant.

The city has voted to take T.V.A. power and has been granted $2,600,000 by P.W.A. to construct a distribution system. Before starting to use this money the city demanded a dollars and cents price on the private utility system in order to determine whether to buy the present system by means of bond issues.

Tennessee Public Service Company owns and operates the street railways in Knoxville and gives service to many outlying rural and small town communities. The municipality desires to buy only the electrical distribution system in Knoxville. It is very evident therefore that sale of part of a property for city bonds under present conditions makes a most difficult problem for the private utility to solve.

A contract between Knoxville and the Tennessee Valley Authority, whereby the city will distribute T.V.A. power from a proposed municipally owned system, was approved February 27 by City Council.

G. W. Peck, Shot, Killed, by Irate Texas Farmer

Disgruntled by the refusal of the Texas Hydro-Electric Company to meet his recurrent demands for additional payments for damages to his property done in the course of certain construction work, Tom Hollamon, a farmer, shot and killed Gerald W. Peck, Chicago financier and president of the company, at a meeting of the board of directors held February 26 at Seguin, Tex. Hollamon had been engaged in a long controversy with the company over payment of damages for the flooding of some land in the construction of a dam on the Guadalupe River. According to a statement made by A. J. Wirtz, attorney for the company, in whose office the shooting occurred, a friendly conversation on the farmer's claims began, but lasted only a few minutes. Then the man turned to leave, but instead began shooting. The first bullet went wild, but the second struck Mr. Peck in the right side, and he died an hour later.

Mr. Peck was born in Milwaukee in 1887 and for more than thirty years had been a Chicago capitalist and investment broker. Recently he became president of the firm bearing his own name, associated with his uncle, Roy Peck, and his brother, David B. Peck. In addition to being president of the Texas Hydro-Electric Company, he was treasurer of the Texas Power Company. Under a contract with San Antonio Public Service Company substantially the entire output of the Texas Power Corporation is sold to the former.

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More Lights at Less Cost

As a result of Moline (Ill.) City Council accepting a new contract offered by the Peoples Power Company the entire "white-way" lighting system will be turned on each night for the next five years. For the purpose of economy only half of the system has been used for the past several months, but because of lowered rates the entire system may now be used. For 1933 and the period of this year ending February 17 the costs of electricity for all purposes amounted to $43,000. Under the new contract the cost will be approximately $41,000.

Large-Salary List Includes Electrical Men

Stirring up sensational facts to make a New Deal holiday the Federal Trade Commission this week reported to the Senate, in reply to the resolution passed by that body in May, a list of salaries and bonuses of all corporations other than operating utilities and railroads with capital and assets in excess of one million. Included were several electrical manufacturing and holding companies shown to have paid salaries in excess of $50,000; most of these have subsequently been sharply cut. The list is similar to that presented by the Federal Power Commission for the utility companies (ELECTRICAL WORLD, February 17, page 277).

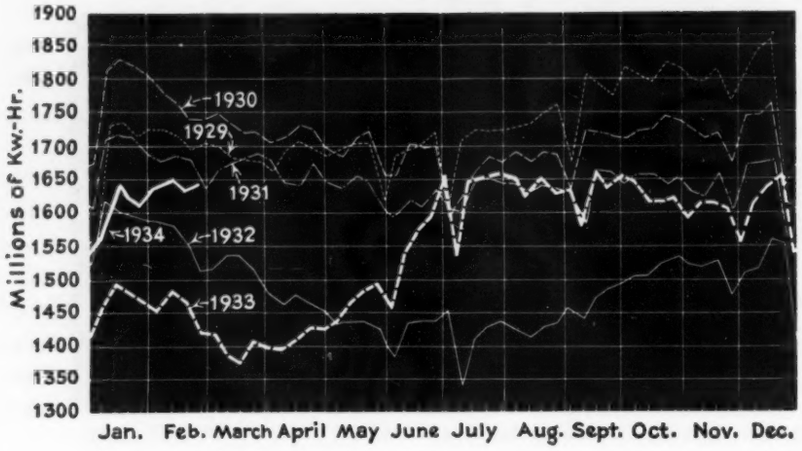
Electric Bond & Share Company group paid six salaries in excess of $50,000, with C. E. Groesbeck receiving a maximum of $251,260 in 1930 and $104,250 in 1932. For 1930 S. Z. Mitchell received $276,560 and in 1931 $109,490. H. C. Abell received $115,120 in 1930 and $56,770 in 1932; Frederick A. Farrar got $110,340, George M. Tidd $183,170 and F. B. Odlum $125,120, all in 1930. The Columbia Gas & Electric Corporation paid P. G. Gossler $251,334 in 1929 and $179,737 in 1931; F. W. Crawford $112,315 and $102,121 for 1929 and 1931, respectively, and paid a bonus of $101,121 to G. W. Crawford in 1929. Commonwealth & Southern Corporation in 1932 paid B. C. Cobb a total of $110,200 and T. W. Martin $130,140.

Manufacturers report

Westinghouse Electric & Manufacturing Company reported a total payment to A. W. Robertson in 1930 of $132,515, which was cut to $69,340 in 1932. Salary alone for 1933 was increased to $73,181. General Electric was one of four to file incomplete returns, so no figures are available.

Allis-Chalmers Manufacturing Company paid Otto H. Falk $53,233 in 1930 for a maximum. American Water Works & Electric Company paid H. Hobart Porter $75,850 in 1929 and $71,850 in 1932. Blaw-Knox paid Albert C. Lehman $71,000 in 1929 and $36,000 in 1933 and Irvin F. Lehman $71,000 and $22,380 for the same years. Electric Power & Light paid H. C. Couch $67,803 in 1932, a maximum. Federal Light & Traction paid E. N. Sanderson $50,000 in 1928-31 and $38,553 in 1932. Stone & Webster, Inc., paid Charles A. Stone, $101,302 in 1930 and $37,500 in 1933. Associated Gas & Electric paid J. I. Mange $60,156 in 1931 and $55,200 in 1933.

Further Gain in Kw.-Hr. Output



With an output of 1,646,465,000 kw.-hr. during the week ended February 24, according to the Edison Electric Institute, central-station energy production gave renewed evidence of an upward trend, in contrast with the usual decrease at this time in other years. It was somewhat greater than in the preceding week, exceeded that of any week in January, overshot output for the corresponding week in 1933 by 15.5 per cent and in 1932 by 8.9 per cent, and missed the highest comparable figure, recorded in 1930, by only 5.7 per cent.

The rise was too large to be accounted for by the weather. In the Central industrial region the increase over 1933 was exceptionally large—nearly 25 per cent. In New England and the Middle Atlantic states it passed 14 per cent and on the Pacific Coast it jumped to 12.5 per cent.

Weekly Output, Millions of Kw.-Hr.

1934	1933	1932
Feb. 24....1,646	Feb. 25...1,426	Feb. 27...1,512
Feb. 17....1,641	Feb. 18...1,470	Feb. 20...1,545
Feb. 10....1,652	Feb. 11...1,483	Feb. 13...1,579
Feb. 3....1,636	Feb. 4...1,455	Feb. 6...1,589
Jan. 27....1,611	Jan. 28...1,470	Jan. 30...1,589

Per Cent Change from Previous Year

Region	Week ended Feb. 24	Feb. 17	Feb. 10
New England.....	+14.2	+13.2	+12.9
Middle Atlantic...	+14.4	+12.1	+11.6
Central Industrial.	+24.7	+15.4	+14.5
West Central.....	+ 7.5	+ 3.1	+ 4.6
Southern States...	+ 4.1	+ 7.0	+10.0
Rocky Mountain..	+16.3	+12.0	+ 8.9
Pacific Coast.....	+12.5	+ 8.9	+ 8.5
United States.....	+15.5	+11.6	+11.4

Interlocking Directorates Assailed by I. C. C.

General evidence of widespread interlocking directorates among holding and operating companies in the field of the electric and gas utilities was laid before the House interstate and foreign commerce committee last week in a report by Walter M. W. Splawn, member of the Interstate Commerce Commission. Through 800 pages and printed graphs and charts Mr. Splawn traced the connections of about 3,000 holding and operating companies with each other and with larger systems, and of a like number of directors and officials of hundreds of these corporations. It was shown that one individual was connected with 240 companies, another with 212, three others with between 175 and 200.

While the report contained no specific recommendations, it was assumed that its findings would figure prominently in any subsequent legislation on the subject. It is the first part of a larger study being made on the relation of holding companies to operating companies. Dr. Splawn said the purpose of the second part of his report would be to show that "local companies are frequently strung together for managerial purposes through ownership of voting stock by a holding company" and that these companies "are sometimes clusters in one geographical region."

240 leads the list

Among the persons shown as connected with a hundred or more companies and the number of companies with which each was connected at the time of the compilation were: E. P. Summerson, secretary of the Electric Bond & Share Company, 240; C. A. Dougherty, secretary of the Associated Gas & Electric Company, 180; Arthur C. Ray, treasurer of the Electric Bond & Share Company, 179; E. T. Edmonds, president of the American Utilities Company, 155; E. W. Hill, vice-president of the Electric Bond & Share Company, 112, and Luke C. Bradley, president of the Alabama Utilities Service Company, 101. Nine individuals connected as officers or directors with at least six systems and the number of systems with which each was connected were given as follows: George H. Howard, 12; F. L. Carlisle, 9; Landon K. Thorne, 8; C. E. Groesbeck, 6; Samuel Insull, Jr., 6; Alfred L. Loomis, 6; S. A. Mitchell, 6; S. Z. Mitchell, 6, and George Roberts, 6. Harvey C. Couch, a director of the Reconstruction Corporation, was disclosed in the report as being a director or officer or both in nine utility companies as of April, 1933.

The report also shows the chain of control of the 3,000 companies dealt with. The outstanding example of indirect control cited is the Richmond Light & Railroad Company, eleven times removed from Associated Gas & Electric properties, referred to as the "top company" of the Associated Gas & Electric System. Staten Island Edison also was cited.

Utility Profits Transfer Carried to Court

Profits transfer from the Birmingham Electric Company to its parent company, the National Power & Light Company, which resulted in both companies being ordered before the Alabama Public Service Commission for a hearing March 20 (ELECTRICAL WORLD, February 24, page 308) was made the cause of a court suit last week when Nellie Overton, preferred-stock holder of the Birmingham Electric Company, filed a petition in Jefferson Chancery Court asking that the National Power & Light Company be required to refund to the Birmingham utility $3,200,000 in dividends on common stock paid from the sale of gas properties.

The suit, which also asks interest from May 29, 1929, alleges the disbursement was wrongfully paid to the National Power & Light as the sum represented part of the capital of the Birmingham company, and should not have been distributed in the form of a special dividend. The petition also alleged that all common stock of the Birmingham Electric, except five shares, is held by the parent corporation and that the Birmingham Electric is $785,974 in arrears in dividends on preferred stock. The court is directed to order that when refunded the interest be used for preferred-stock dividends and the remainder retained by the utility as capital.

Power Policy Hit

Criticism of the "sinister" power policy of the Roosevelt administration was one of the features of the opening session of the 1934 annual convention of the American Institute of Mining and Metallurgical Engineers held in New York last week.

As to Rates——

• Public Service Electric & Gas Company's rate investigation before the New Jersey Board of Public Utility Commissioners last week was devoted to showing that as the Kearny plant of the company was being built, the engineering and contractor's fees increased far out of proportion to increased construction costs. John A. Matthews of counsel for petitioners developed that when a sub-contract was let by the Public Service Production Company, contractor on the job, a fee was charged on the amount paid the sub-contractor. The fee of the construction company, which was owned by Public Service Corporation, was 7½ per cent of the total cost, including materials, labor, engineering and supervision. Details of transfers of properties by Public Service Corporation of New Jersey to the Public Service Electric & Gas Company were also discussed. Mr. Matthews called attention that while the real estate holdings of Public Service Corporation were $12,651,356 in 1929, in 1930 and subsequent years the realty holdings were only $83,480. "My honest opinion," Mr. Matthews said, "is that a great deal of the piled up costs of property was put on the electric and gas company in what I would characterize as a wholesale unloading."

New Orleans utility protests

• New Orleans Public Service, Inc., at a recent hearing before Commission Council, asserting that its revenues during the past four years have been so materially reduced along all lines that a reduction in electricity rates at this time would be a financial calamity, began a fight to prevent the reduction proposed in a drafted ordinance. Last May a study of rates and economies was ordered by City Council and early this month the Council ordered the company to appear before it and show cause why the electric rates should not be reduced. At the recent hearing Mayor Walmsley stated he realized the company was entitled to a fair return on its investment, but that Council must at the same time be mindful of its duty to the people. Following the Public Service company's answer and the Mayor's reply Council took no definite action except to authorize officials of the company to confer with city utilities' engineers and auditors of the utilities' department regarding noticeable discrepancies as between the figures submitted by the company and those submitted by the city.

• United Electric Light Company has been ordered by the Massachusetts Department of Public Utilities to cut its rates approximately $100,000 a year. The present rate of 5½ cents per kilowatt-hour will now apply to the first 75 kw.-hr. used, excess being billed at 3 cents. A minimum charge of $9 per year is permitted.

• Florida Power & Light Company's franchise in the city of Miami was held valid by Federal Judge William B. Sheppard, who overruled both contentions on which the city based a suit against the company, seeking a 33 per cent reduction in rates. The court held that the company's franchise is valid and good, and that the company has the right to apportion cost of property outside the city limits in its Miami rate base. The hearing was on the city's motion to dismiss the power company's bill of complaint on which it sought a permanent injunction to prevent lower rates.

• Virginia Public Service Company hearing before the state Corporation Commission on the operations and rates of the company has been continued until March 15. The continuance was granted on petition of the company, whose representatives said that the possible action of the present assembly in raising the taxes on utility companies is a material factor, and the conference, therefore, should wait until the legislative body makes a decision.

Municipal Items

GRAND RAPIDS, MICH.—With petitions being circulated to force a vote on a charter amendment prohibiting leasing of municipally owned utilities to private corporations (ELECTRICAL WORLD, February 24, page 311), the Consumers Power Company announced that it would not seek renewal of its lease of the city lighting system, but will return it to the city June 1. The company submitted a report by engineers showing that the city had saved $90,000 in the last three years by leasing to the company. The charter amendment was sought specifically to prevent renewal of the lease.

ALBIA, IOWA.—Proposals to establish a municipal light and power plant at an outlay of $636,000, under provisions of the Simmers law, was vetoed at a special election held recently, the majority being 453 votes. The town is being served at present by the Iowa Southern Utilities Company.

DANVILLE, VA.—After a bitter campaign, in the course of which intense feeling developed, citizens by a vote of 1,682 to 1,498 decided February 27 not to borrow $3,000,000 from the federal government to build a new electric power plant operated by water at the Pinnacles in Patrick County. The grant was to be from the Public Works Administration, which was to get back only $2,250,000 of the sum to be loaned.

OSKALOOSA, IOWA.—Final canvass of the votes at the special election held recently on a proposal that the city issue $322,883 in bonds to help finance a municipal light and power plant to cost $462,000 revealed that 1,915 had voted for the proposition and 1,915 against it. The city had planned to obtain a grant of $140,000 from the Federal Public Works Administration to make up the balance of the estimated cost and to give the bonds to the P.W.A. for a loan of $322,883. Mayor George Burdock, advocate of the municipal plant, plans to challenge the results of the election in the courts and, failing in that move, will seek another election.

CHESTERTON, IND.—Public necessity and convenience do not require a municipal plant, according to a ruling of the Circuit Court at Valparaiso on a suit brought against the city by the Northern Indiana Public Service Company. City officials adopted a resolution last year asserting that public necessity dictated that the municipality acquire the power lines of the company and that a municipal plant be constructed. The company sought a judicial review to determine whether this action was necessary. The court ruled that electric service supplied by the company was adequate; that the city had no definite plan for financing its venture into the power business, nor did it have accurate or adequate information as to methods or cost of financing.

AINSWORTH, NEB.—Rehearing in the case of the Interstate Power Company sought by city (ELECTRICAL WORLD, December 9, page 745) has been denied by the Nebraska Supreme Court, which ordered a mandate to be issued perpetually enjoining the municipality from entering into a contract with the Fairbanks-Morse Construction Company for the construction of a plant to become the property of the city when cost plus interest had been paid out of future earnings. The court had held that there was no expressed or implied power in the law to enter such a contract, and distinguished it from a case where a municipality already owned a plant and desired to pledge future earnings to finance additions.

CAMDEN, N. J.—City Solicitor Bleakly has served notice on Public Service Electric & Gas Company that he will petition the State Supreme Court to dismiss the company's suit to block construction of a municipal electric plant. Mr. Bleakly charges that the company is attempting to delay the prosecution of the litigation and to confuse the real issues involved by showing that because some signers of the petition were disqualified, therefore, inferentially, many more might be claimed to be illegal. Dismissal of the suit will be asked at the next term of court, May 1.

FINANCIAL · · · BUSINESS

Mid-West Hearings End; Illinois Write-Downs

The Insull "town meeting" before Federal Judge Lindley in Chicago, investigating the Middle West Utilities receivership, wound up last Friday and now waits upon the decision of the court. The last session climaxed with a challenge from Attorney Ettinger to Receiver Charles A. McCulloch as to why he did not resign. Mr. McCulloch stated that at one time he wanted to resign, but that he would not do so now while under fire. "More damage has been done to the morale of Middle West," he said, "by the delay and the keeping of my organization here than anything that has occurred since Martin Insull left."

Gains under receivers

Meanwhile Nicholas Zech, Middle West controller, testified that the company's position had been improved $14,176,000 since Charles A. McCulloch and his colleague, the late Edward N. Hurley, took charge as receivers. The controller said that the receiver had acomplished an increase of cash on hand, a reduction in floating debt, a reduction in outstanding bonds of operating subsidiaries and an increase of investment in United States bonds. Robert N. Golding, counsel for the holders of Middle West's $40,000,000 gold note issue, testified to entire confidence in the receivership.

This week shareholders of the Public Service Company of Northern Illinois voted to reduce the par and stated values of the company's common shares to wipe out the deficit and hasten the return to dividends.

The resolution adopted called for revaluation of common stock at $60 to permit the creation of $26,090,517 capital surplus, with additional investment and liquidation reserves of $18,500,000. These adjustments eliminate earned surplus, but prepare the way for the resumption of dividend payments on the company's senior stock issues.

Stockholders of the Commonwealth Edison Company, the same day, also voted less drastic but far-reaching adjustments. These include a transfer of $8,618,484 to earned surplus from various reserves, the retransfer of $1,517,000 to capital surplus and $1,576,000 to investment reserves, bringing that account to $37,904,385. Principal investments in stock of affiliated utility companies showed no important changes, but their total book value was written down $2,814,843 to a total of $80,594,723. Investments in coal properties were written down $2,433,020 to a total book value of $8,089,320.

FASTER

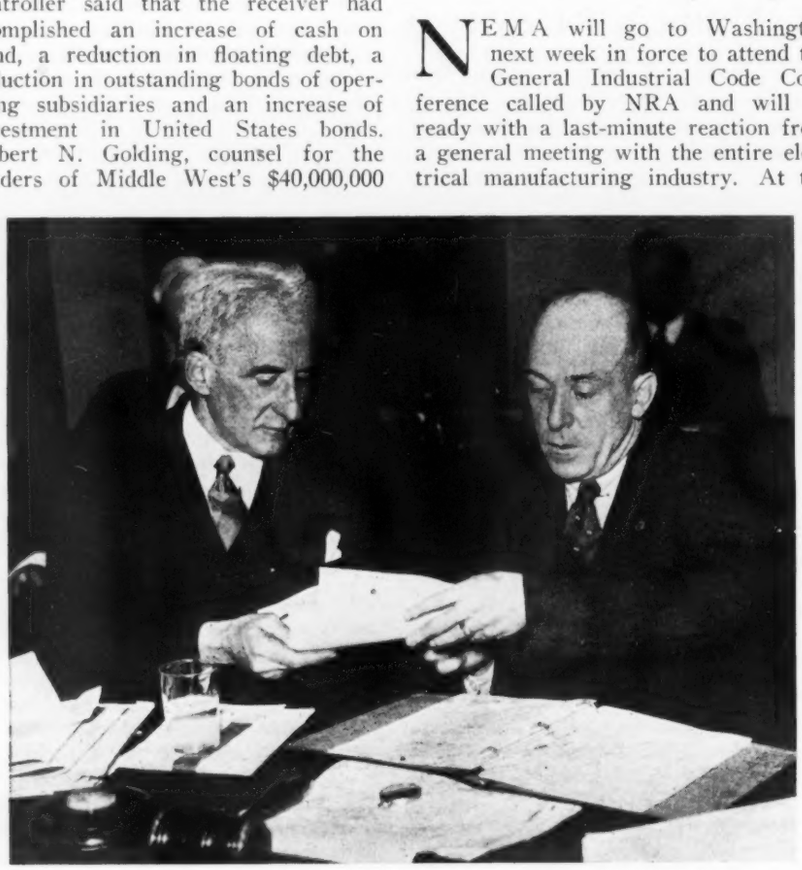
Definite acceleration to the business pace, which had begun to turn a little listless, is reflected in current figures. Energy production now 15½ per cent over last year, up considerably from last week. Steel at 45 per cent of capacity, against 42 per cent previously. Automobile output at February, 1930, levels and 250 per cent over a year ago. Carloadings 13 per cent over 1933. Bituminous coal output at three-year high.

Commodity prices recede somewhat after touching year's high. Security markets fluctuate indifferently.

Electrical manufacturers reported building appliance stocks in anticipation of large spring market.

NEMA Ready for Code Review

NEMA will go to Washington next week in force to attend the General Industrial Code Conference called by NRA and will be ready with a last-minute reaction from a general meeting with the entire electrical manufacturing industry. At the call of General Johnson, this conference will bring together all the code authorities for a discussion of complaints and the possibilities for code revision wherever needed. There will be five group meetings to consider: (1) Possibilities of increasing employment; (2) cost prices and competition; (3) control of production; (4) code authority organization, and (5) operation of codes in small enterprises. NEMA representatives fresh from the general industry meeting in New York this week (too late to make this issue), will be: Group 1, J. S. Tritle and E. O. Shreve; group 2, F. C. Jones and F. E. Neagle; group 3, H. B. Crouse and S. L. Nicholson; group 4, C. L. Pierce, Jr., F. E. Neagle and A. W. Berresford, and group 5, F. R. Fishback and D. G. Phelps.



Gerard Swope, president of the General Electric Company, reviews the 30-hour week bill of Representative William P. Connery, Jr., of Massachusetts of the House labor committee and urges control under the code

Swope urges shorter week

Gerard Swope, president of the General Electric Company, testifying before the House labor committee last week, urged that the shorter week recommended by the committee be accomplished through the flexible operation of the code authorities rather than the more rigid process proposed by the Connery bill. He favored the shorter day, but felt that to handle exemptions for 30 hours by a federal board would put prices up and restrict consumer purchasing. If any further reductions of hours is advisable, he believes that it can be handled more scientifically and intelligently under the code and should

be done as a percentage reduction in the number of hours in the codes.

Mr. Swope said there had been little increased employment in the capital goods industries, which are still operating below the maximum hour set. The departments of his own company, that turn out capital goods, he stated, are employed less than 30 hours, with one exception. Since the electrical manufacturing code went into effect the General Electric Company has taken on 15,000 additional men with an increase in annual payroll of $17,000,000.

North American Changes Ten-Year Dividend Policy

After paying common dividends for ten years entirely in common stock, the North American Company has declared a quarterly cash dividend of 12½ cents per share and 1 per cent payable in common stock. Two per cent had been paid previously on the common stock. The regular cash preferred dividend of 75 cents a share was also declared. This change in a long-standing policy unusual in American industry was of especial interest, following the recent change of administration upon the death of F. L. Dame. In announcing this new dividend basis President J. F. Fogarty said:

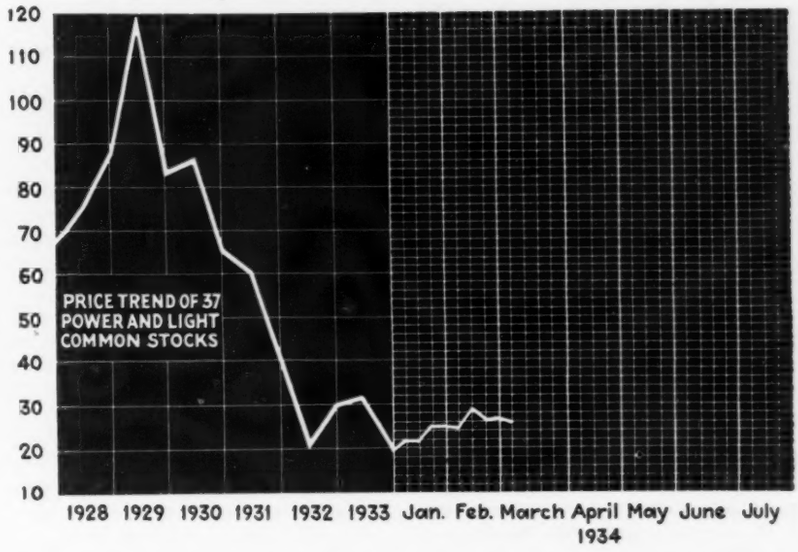
"The action of the directors in declaring part of the dividend on the common stock payable in cash reflects their opinion that, while present conditions continue, part of the available earnings should be paid to the common-stock holders in cash rather than retained entirely for investment in the business as heretofore. It is believed, however, that providing part of the funds for capital additions of subsidiaries which are necessary even under existing conditions will afford profitable employment of the funds retained, through payment of part of the dividend on the common stock in common stock.

"The policy inaugurated in 1923 of paying all dividends on the common stock of the North American Company in its common stock has contributed in large measure to the strong financial position which the company and its subsidiaries have maintained throughout the depression."

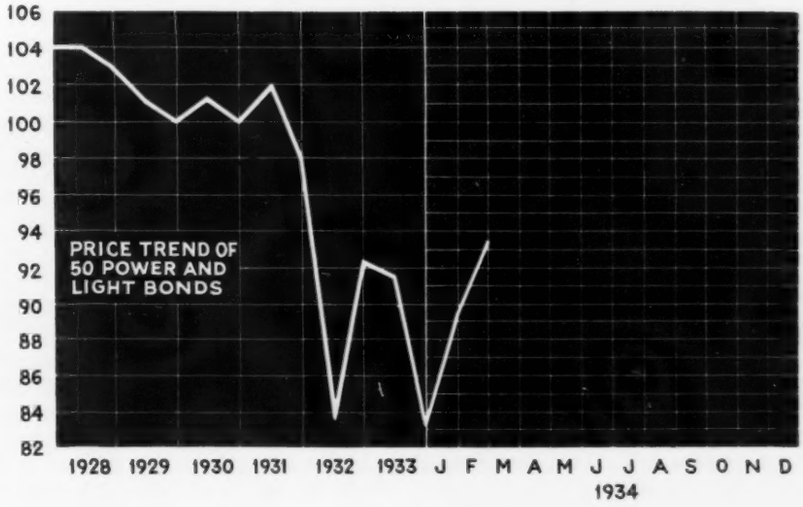
British Electric Capital

Figures recently compiled indicate that the British electrical supply industry now carries an aggregate subscribed capital in shares, debentures and loans of approximately $2,000,000,000. Prediction has been made that electrical stocks will continue to maintain their dividend payments, further evidence of the favorable position held by the industry in the investment field.

Security Price Trends Mixed



Though the best-grade bond prices stand at the highest point since 1902, the market shows little inclination to proceed further. "Electrical World" average January, 89.8; February, 93.4. Fear of pending legislation has led to general stock losses; average this week, 25.6; last week, 27.4



Utility Claims Met

At a recent meeting the Indianapolis City Council approved a bond issue of $330,702 for use in paying judgments against the city for utility bills. Of this amount $139,239 will be used for claims of the Indianapolis Power & Light Company.

Utility to Refund Bonds

Tentative plans for refinancing $10,272,000 of first and refunding mortgage 5 per cent bonds of the Virginia Railway & Power Company, a Stone & Webster unit, due July 1 have been released providing for exchange of these bonds for an equal amount of 5½ per cent ten-year convertible bonds. While details have not been agreed upon, it is contemplated that a cash payment of $60 will be made to the holder of each $1,000 bond and the new bonds will be convertible into 100 shares of Virginia company stock.

Electric C. & M. Cuts Loss

Electric Controller & Manufacturing Company in its report for the year ended December 31, 1933, show net loss of $79,150 after depreciation, charges, etc., comparing with net loss of $369,889 in 1932. Current assets as of December 31, 1933, amounted to $1,173,934 and current liabilities were $32,555, compared with $1,739,247 and $42,852, respectively, at end of preceding year.

Trade Commission Hits Misbranded Bulbs

Selling misbranded electric light bulbs or lamps met prohibition in an order issued last week by the Federal Trade Commission. In a proceeding against the White-Lite Distributing Corporation and Alexander H. Fishberg, doing business as Sun Sales Distributing Company, both of New York City, the commission found that both companies sold electric light bulbs marked with substantially less than the correct number of watts, indicating that the bulbs would use less electric current to operate than they actually did.

The proceeding against the White-Lite company was dropped for the reason that the company was dissolved after the trial began. Fishberg was ordered by the commission to cease selling lamps misbranded as to power consumption and to stop representing his bulbs as complying with the Bureau of Standards or registered with the Patent Office unless such is the case. The findings showed Fishberg's 50-watt lamps actually consumed 69.8 watts and gave less illumination than standard 50-watt bulbs sold by his competitors.

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$779,000 Equipment Order

Approval of a $779,000 contract with the General Electric Company has been given by the chief of army engineers for motors, controls, switchboards and spare parts for dredges on the army Fort Peck project, Missouri River division, Kansas City district. For this project, which is located in eastern Montana, a total of $25,000,000 has been allocated from P.W.A. funds.

Cable Code Changes

Beginning March 1, all conductors used in the manufacture of armored cable will have the special new finish called for in the 1933 edition of the National Electrical Code, according to the Underwriters' Laboratories. No armored cables fabricated after that date will use individual conductors that are not "covered for their entire length with a braid which is both flame-retarding and moisture-resisting." A similar requirement with respect to rubber-covered wires became effective in the label service work for that product on January 1. Large quantities of armored cables in stock were labeled in good faith so the laboratories recommend that all such existing stocks be accepted in installations until exhausted.

T.V.A. Appliances to Be Exhibited

Electric Farm and Home Authority, two months old, expects to have acceptable ranges, refrigerators and water heaters available shortly. These will be exhibited as models at the headquarters of the National Electrical Manufacturers Association in New York on March 9 and full production for operations of E.F.H.A. will be available by May 1. Standards for these devices were agreed to in conferences with groups of manufacturers held at intervals recently at which the E.F.H.A. and the Bureau of Standards were represented. It is possible that the Bureau of Standards and the Bureau of Home Economics will both assist in testing appliances preparatory to the latter receiving the official approval of E.F.H.A.

It is also announced by Llewellyn Evans of the T.V.A. that Congress will be asked to appropriate $200,000 during 1934-35 to build ten homes and five farms and equip them with the latest modern electrical equipment. These would be built-in installations located in Tennessee to demonstrate modern electrical equipment and foster greater use of energy.

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Air Conditioning Bureau

To push modernization of atmospheric conditions in homes and buildings, create business for manufacturers, dealers, jobbers and power utilities, the Air Conditioning Bureau of Boston has been organized by a group of about 100 representatives of this growing activity. Julius Daniels of the Edison Electric Illuminating Company of Boston was elected president of the group.

Servel Shows Quarter Loss

Servel, Inc., and subsidiaries report loss of $160,888 after bond interest and all other charges for the quarter ended January 31. In arriving at this result $241,966 of the $275.000 reserve established for factory overhead was used, leaving $33,034 still in the reserve account. Current business is showing a gratifying upturn. During the quarter facilities for the production of Electrolux refrigerators was expanded 35 per cent and production was only resumed the latter part of December.

Major New Construction This Week

Northern States Power Company, Eau Claire, Wis., plans $50,000 transmission line from La Crosse to Genoa, Wis., about 5½ miles.

Until March 7, United States Engineer Office, Kansas City, Mo., asks bids for construction of 154,000-volt transmission line from Rainbow power plant of Montana Power Company, near Great Falls, to site of Fort Peck dam project, Missouri River, near Glasgow, Mont., totaling 287 miles of line.

Transformers, motors, controls, regulators, conveyors and other equipment will be installed in pulp and paper mill to be constructed by Fernandina, Fla., and leased for operation to Union Bag & Paper Company, New York, N. Y. Federal financing of $5,500,000 being arranged.

Pasadena, Calif., plans underground conduit system for power lines at Lamanda Park substation. Cost $38,000.

Gowrie, Iowa, asks bids until March 19 for equipment for city-owned Diesel electric light and power plant and electric distribution lines. Fund of $80,000 available.

Motors, controls, regulators, electric elevator, conveyors, etc., will be installed in $150,000 addition to Los Angeles, Calif., plant of Continental Can Company, New York, N. Y.

Iowa Electric Company, Cedar Rapids, Iowa, plans new transmission lines in parts of Johnson and Muscatine Counties. Application made for permission.

Milwaukee, Wis., has made application for federal loan and grant for $14,000,000 for new 75,000-kw. city-owned electric light and power plant and has engaged engineer to draw plans.

Southern Brewing Company, Tampa, Fla., plans extensions and improvements to cost $100,000.

Refrigerator Sales Drive

Announcement of a concentrated 66-day sales drive by General Electric refrigerator distributors starting March 15 featured the annual spring sales convention of distributors held at Nela Park, Cleveland, recently. It is expected that 50 per cent of the entire year's sales quota will be realized in the campaign. The drive is to be aided by an extensive advertising and demonstration program, and tieing in with the activity will be a new spring sales contest in all selling divisions of the refrigeration department.

Blaw-Knox Reports Profit

Report of the Blaw-Knox Company and subsidiaries for 1933 shows a net profit after depreciation, taxes and other charges of $111,666, equal to 8 cents a share on 1,322,395 no-par capital shares of stock. This profit compares with a net loss in 1932 of $671,966.

New York Metal Prices

	Feb. 20, 1934 Cents per Pound	Feb. 27, 1934 Cents per Pound
Copper, electrolytic	8.00	8.00
Lead, Am. S. & R. price	4.00	4.00
Antimony	7.15	7.20
Nickel ingot	35.00	35.00
Zinc, spot	4.75	4.75
Tin, Straits	52.00	52.50
Aluminum, 99 per cent	23.30	23.30

MEN OF THE INDUSTRY

L. B. Stillwell Awarded Lamme Medal by A. I. E. E.

L. B. Stillwell, consulting engineer and an outstanding leader in the development of alternating current, has been awarded the 1933 Lamme medal of the American Institute of Electrical Engineers "for

his distinguished career in connection with the design, installation and operation of electrical machinery and equipment." Presentation will be made at the summer convention of the institute, which is to be held at Hot Springs, Va., in June. He began his practice as a consulting engineer in New York City in 1900 and has filled engagements with many companies on large and important engineering projects.

A native of Scranton, Pa., Mr. Stillwell obtained a degree in electrical engineering from Lehigh University in 1885 and one year later entered the employ of the Westinghouse Electric & Manufacturing Company as assistant electrician. Five years later he was appointed chief electrical engineer, a position he held until 1897. He was an outstanding leader in the development of alternating current and had an active part in the determination of Westinghouse policy with respect to system development engineering and the establishment of 60 and 30 cycles as standard frequencies. Among his most important inventions are the "Stillwell regulation," for the adjustment of voltage on outgoing lines, and "time-limit circuit breaker," used to localize interruptions of service due to short circuits. His contributions, as Westinghouse engineer, to the general layout and design of the first plant of the Niagara Falls Power Company led to his appointment as electrical director of the latter company, the position he held until 1900.

A fellow and a past-president of the American Institute of Electrical Engineers, Mr. Stillwell has been active in its affairs for many years, having served on many of its most important committees, including the executive, code of principles of professional conduct, public policy (now institute policy), Edison medal, standards and board of examiners. He is a member of the American Institute of Consulting Engineers, American Society of Civil Engineers and the Institution of Electrical Engineers, Great Britain.

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ANNING S. PRALL, representative from New York, has been appointed by President Roosevelt to membership on the Federal Radio Commission to take the place of William D. L. Starbuck, whose term has expired. Mr. Prall is completing twelve years of service in the House. He was president of the New York City Board of Education for four years and was also a city commissioner of taxes.

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T. C. Clark Elected to Kearney Vice-Presidency

Tom C. Clark, who has been identified with the electrical industry for a number of years, has recently been elected a vice-president of the James R. Kearney Corporation of St. Louis, Mo. Mr. Clark brings to his new executive position a competent understanding of the problems which face the utility operator. His past connections include thirteen years of operating experience with the

Union Electric Light & Power Company of St. Louis, where his last position was division superintendent of overhead construction. He is also experienced in the sales field by virtue of his connection as sales manager with an organization manufacturing utility equipment.

R. W. LAMAR, for the past five years assistant general manager of the Tennessee Public Service Company, Knoxville, has been elected vice-president and general manager of that company to succeed the late F. V. Underwood. Mr. Lamar entered the public utility business upon graduation from Washington University, St. Louis, Mo., in 1907.

OBITUARY

CARROLL E. BAILEY, vice-president of the J. G. White Engineering Corporation, killed himself February 26 at the Hotel Shelton, New York, which had been his home for four years. A graduate of Cornell University, Mr. Bailey had been with the J. G. White organization since 1908. He was 63 years of age.

GEORGE E. FISHER, fire protection engineer for the Arkwright Mutual Fire Insurance Company, Boston, for the past 25 years, died suddenly at Natick, Mass., on February 5. Mr. Fisher was formerly engaged in the electrical contracting business at Boston and was widely known in electrical circles in eastern Massachusetts, most of his work being in that field.

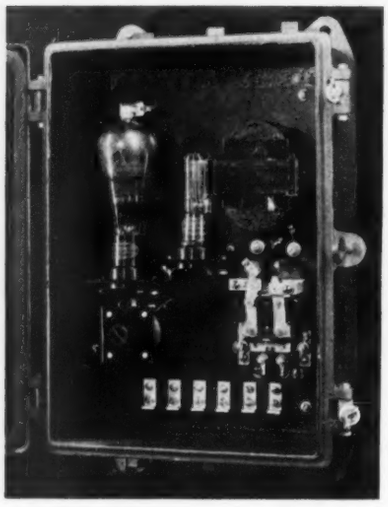
FRANCIS L. GILMAN, formerly treasurer of the Western Electric Company, died at Montclair, N. J., February 25 after an illness of six weeks. A native of New Bedford, Mass., and a graduate of Harvard, Mr. Gilman entered the Bell Telephone system in 1895 as an engineer for, the New England Telephone & Telegraph Company at Boston. After occupying various positions in New York, Chicago, London (England) and Kearny, N. J., he was elected treasurer of the company in 1926, the office he held until his resignation last October.

THOMAS G. GRIER, prominently connected with the electrical manufacturing industry, died February 16 in Phoenix, Ariz., after a long illness. He was in his sixty-ninth year. A native of Lewisburg, Pa., and a graduate of the University of Pennsylvania, Mr. Grier first became connected with the electrical industry through his connection with the Marr Construction Company in 1887. He later became western manager of the Bryant Electric Company, subsequently assuming charge of the western territory for Harry Hubbell. At one time he was active in promoting the sales of the H. T. Paiste Company, and was thus closely identified with the wiring device business for more than 40 years. Mr. Grier also served as advertising manager of the Western Electric Company and had held the selling agencies of several industrial companies.

NEW EQUIPMENT

Sensitive Industrial Photo Controllers

Photo controllers especially adapted to industrial light sensitive applications requiring operations on low light intensities and known as type RK "Photo-Trollers" are offered by the Westinghouse Electric & Manufacturing Company for all commercial power sources, except d.c. The indoor model operates



on 3 foot-candles with phototube extended at distances up to 10 ft. It will operate on as little as ½ foot-candle with pickup lens, and with standard light sources will cover up to 50-ft. throw. Standard invisible beams operate the RK units at 20 ft.

These controllers are rugged, as the phototube operates the grid glow tube, which in turn closes the contactor, and delicate intermediate relays are eliminated. Both tubes are rugged industrial type, contactor is provided with make-and-break contacts for any operation sequence and contacts will carry 20 amp. at 115 volts or 15 amp. at 220 volts, a.c. Speeds of operation as high as 300 per minute are obtained.

Heavy Flexible Couplings

All-steel lubricated gear type flexible couplings which have four points to permit relative movement if shafts become misaligned are announced by the John Waldron Corporation of New Brunswick, N. J. Torque ring couplings consist of two solid rings with teeth cut inside and outside, thus providing quadruple engagement or four points at which relative movements between the co-operating teeth can freely take place and thereby take care of misalignments or endwise displacement of the connected shafts. Fifteen sizes are available for shafts from 1⅞ to 12 in. with ratings from 22½ to 4,480 hp. per 100 r.p.m.

Large Photoflood Lamps Are More Efficient

Photoflood lamps said to be more than twice as effective photographically as any other 1,000-watt lamp have been announced by the General Electric Company, Nela Park, Cleveland. The "Mazda Photoflood No. 4" produces four times as much light as the Photoflood No. 1. They are the same size and shape as the regular 300-watt "Mazda" lamp with mogul screw base and inside-frosted bulb and can be used interchangeably by a photographer with flashlamps in one reflector.

These lamps produce 1½ times as much illumination as the regular 1,000-watt "Mazda" lamp, but with improved color quality in the light such that the No. 4 type is easily twice as effective photographically. With this type lamp the desired light effect can be had more economically with fewer light sources and less heat produced.

Metal-Clad Mercury Switch

In the metal-clad mercury switches now available from the Jefferson Electric Company, Bellewood, Ill., the insulator which supports the center contact and isolates it from the outer casing is so formed as to insure a mercury-to-mercury contact and protect the metal parts from damage. Switches are available in several styles—grounded type with one lead, two-lead type and insulated two-lead type—and in capacities up to 15 amp. All types have bakelite caps and the insulated type has a bakelite case. The other types have selected iron cases which prevent amalgamation and are treated to prevent corrosion. The design permits operation through a very narrow arc and is so compact that installation space required is small.

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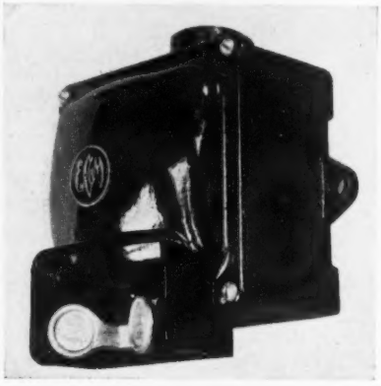
FLEXIBLE EXPLOSION-PROOF CONDUIT FITTINGS that are watertight and vapor-tight are announced by the Pyle-National Company, Chicago, under the name "Pyle-O-Flex." The new fittings meet the demand for an explosion-proof and watertight conduit which would have the ease of application and installation of standard flexible cable. The fittings withstand vibration and are capable of holding against 500 lb. hydrostatic pressure and are tested against leaks under water at 50 lb. air pressure. They are listed by the Underwriters Laboratories for use in Class I, Group D, and Class II, Group G, hazardous locations.

Safety-Lock Push Button

For use in connection with the remote control of automatic motor starters the EC&M 270-A Type J, Form C vapor- and dust-proof safety lock-out push-button control has been introduced by the Electric Controller & Manufacturing Company of Cleveland. For three-wire,



low-voltage protection installations, where it is desired to start and stop a motor through its magnetically operated starter or controller from two or more stations, this push button has been designed to permit padlocking any station in the "off" position until one so authorized unlocks the lock and permits control from that point. Push buttons are inclosed in a dust-proof and vapor-proof inclosure, making them suited for safe operation in dusty or gaseous locations.

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FRACTIONAL-HORSEPOWER MOTORS of three types, having many improvements to make them more efficient and trouble free, are announced by the Westinghouse Electric & Manufacturing Company. Type FS polyphase squirrel-cage motors are available for all voltages and frequencies, two and three phase, in ratings ⅛ to ¾ hp. Type FR repulsion-start induction motors for high-torque, constant-speed service are rated single phase, 110 and 220 volts, in sizes ⅛ to ¾ hp. Type FK direct-current shunt, compound and series wound motors are available from 1/30 to ¾ hp. in size and for voltages of 32, 115 and 230. The two first have rigid base mounting and sleeve bearings, while the third has similar bearing mounting but resilient frame base. All three are mechanically interchangeable with regard to mounting.